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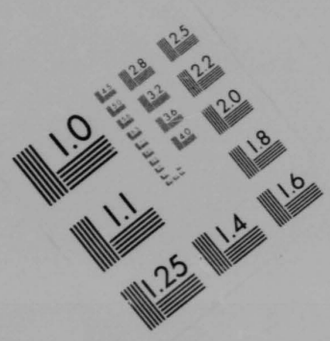
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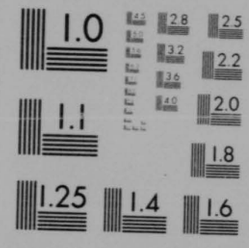
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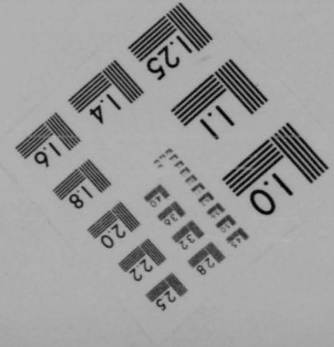






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142.621-3
APR 1943

JAPANESE SHIPPING

AIR ATTACK DATA

APRIL 1943

OFFICE OF THE
ASSISTANT CHIEF OF AIR STAFF, INTELLIGENCE
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Part I. Directive

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S E C R E T

SUBJECT: Supplementary Material on Japanese Shipping

TO: Assistant Chief of Air Staff, Intelligence March 29, 1943

FROM: Howard C. Davidson, Brigadier General Comment 1

1. It is requested that a brief report be prepared on Japanese Shipping designed to show

a. Monthly or seasonal tonnage movement of Japanese merchant shipping by major commodity and other important categories.

2. The foregoing material is requested to supplement data previously submitted to this office by the Directorate of Intelligence Service (War Eastern Unit, Target Information Section).

/s/ Howard C. Davidson,

HOWARD C. DAVIDSON,
Brigadier General

S E C R E T

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Part II, Answering Memo &
Outline of Report

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S E C R E T

April 10, 1943

MEMORANDUM FOR BRIGADIER GENERAL HOWARD C. DAVIDSON.

SUBJECT - Japanese Shipping

1. Pursuant to a directive from Brigadier General Howard C. Davidson, dated March 29, 1943, this study of Japanese Shipping is submitted to provide more detailed operational information to supplement the section on "Shipping" in "Japanese Target Data - March 1943" and other material previously submitted by this office.

2. This report analyzes Japanese Shipping to show:

a. Commodity Data

(1) Tonnage movement of essential commodities by port of origin necessary to sustain current Japanese war production.

(2) Disposition of shipping employed in the movement of these essential commodities.

(3) Seasonal variations in such movements due to rice and sugar movement and weather conditions.

b. Ship Concentrations

(1) Evaluation of Japanese-controlled ports in terms of geographical dispersion and size of ship concentrations calculated to be found in each.

(2) Description of the principal harbors covered by this study - supplemented by harbor charts and photographs where available.

c. Shipping Position

(1) Japanese merchant marine position as of January 1943.

(2) Shipbuilding and repair capacity by major yards.

(3) Estimated merchant shipping employed in purely military operations.

3. To suggest a pattern of air attack against Japanese shipping, the more significant concentrations are designated as KEY SHIP CONCENTRATIONS (17). From these have been selected those concentrations of outstanding importance, which are designated as PRIORITY SHIP CONCENTRATIONS (10).

4. The last section comprises a Target Index of all Far Eastern port and shipyard installations which are covered in the Air Objective Folders published by the Assistant Chief of Air Staff, Intelligence. These targets are grouped by Objective Areas. The corresponding Objective Folders provide photographs, plans, and detailed information as to structural characteristics required in the determination of bombing requirements.

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5. Study of the vulnerability to air attack of Japanese Shipping is being continued, and additional information will be presented from time to time as it becomes available.

A. W. BROCK, JR.,
Colonel, G. S. C.,
Deputy Assistant Chief of Air Staff,
Intelligence.

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OUTLINE OF THE REPORT

Part I. Directive.

Part II. Answering Memo and Outline of Report.

Part III. Report.

Part IV. Port Descriptions, Maps and Photographs.

- Tab A. China
- Tab B. Taiwan
- Tab C. Indo-China
- Tab D. Manchukuo
- Tab E. Philippines
- Tab F. Chosen
- Tab G. Japan
- Tab H. Thailand
- Tab I. Malaya
- Tab J. East Indies

Part V. Objective Folder Target Index.

- Tab A. Harbor Facilities and Warehouses.
- Tab B. Naval Bases and Shipyards.

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Part III. Report

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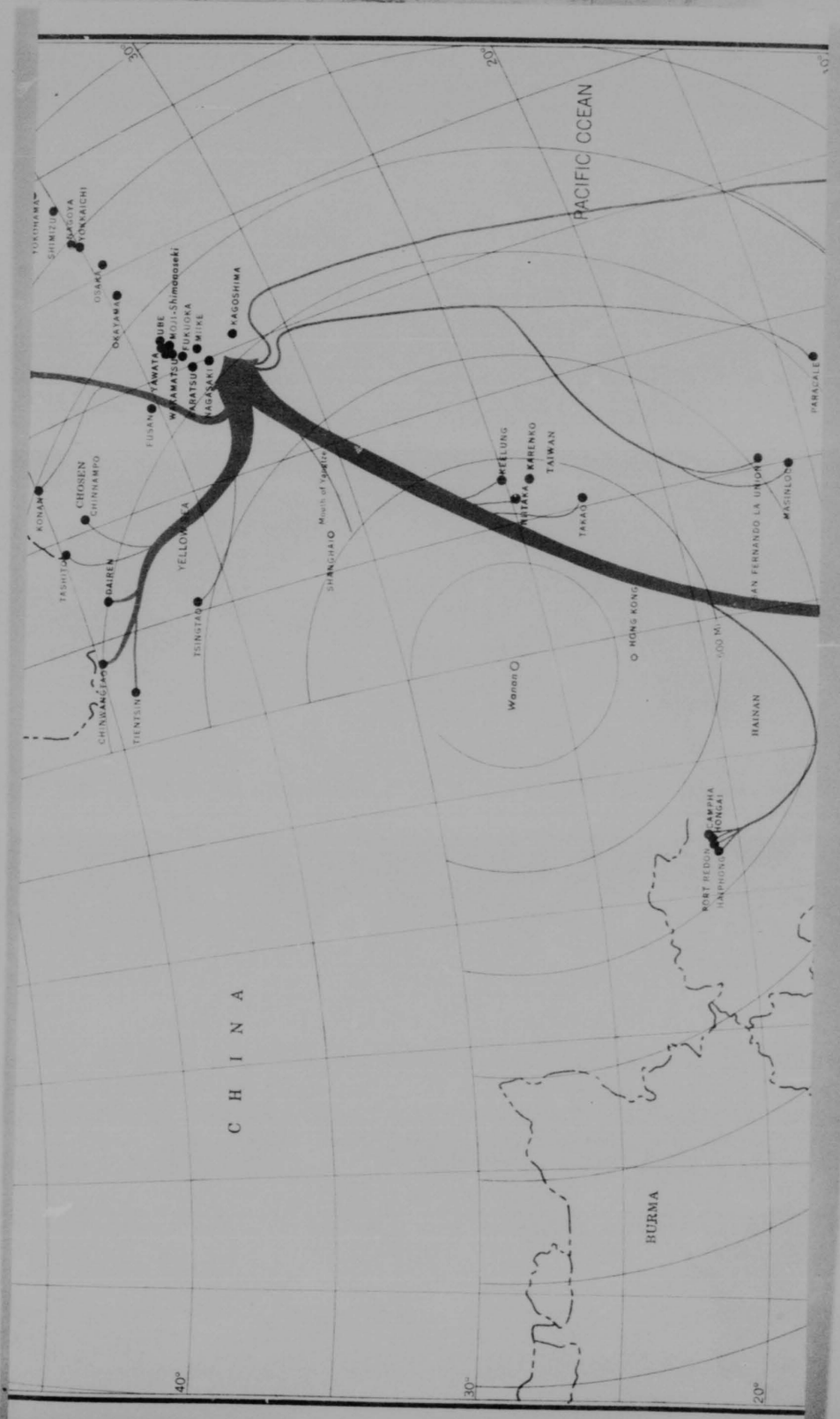
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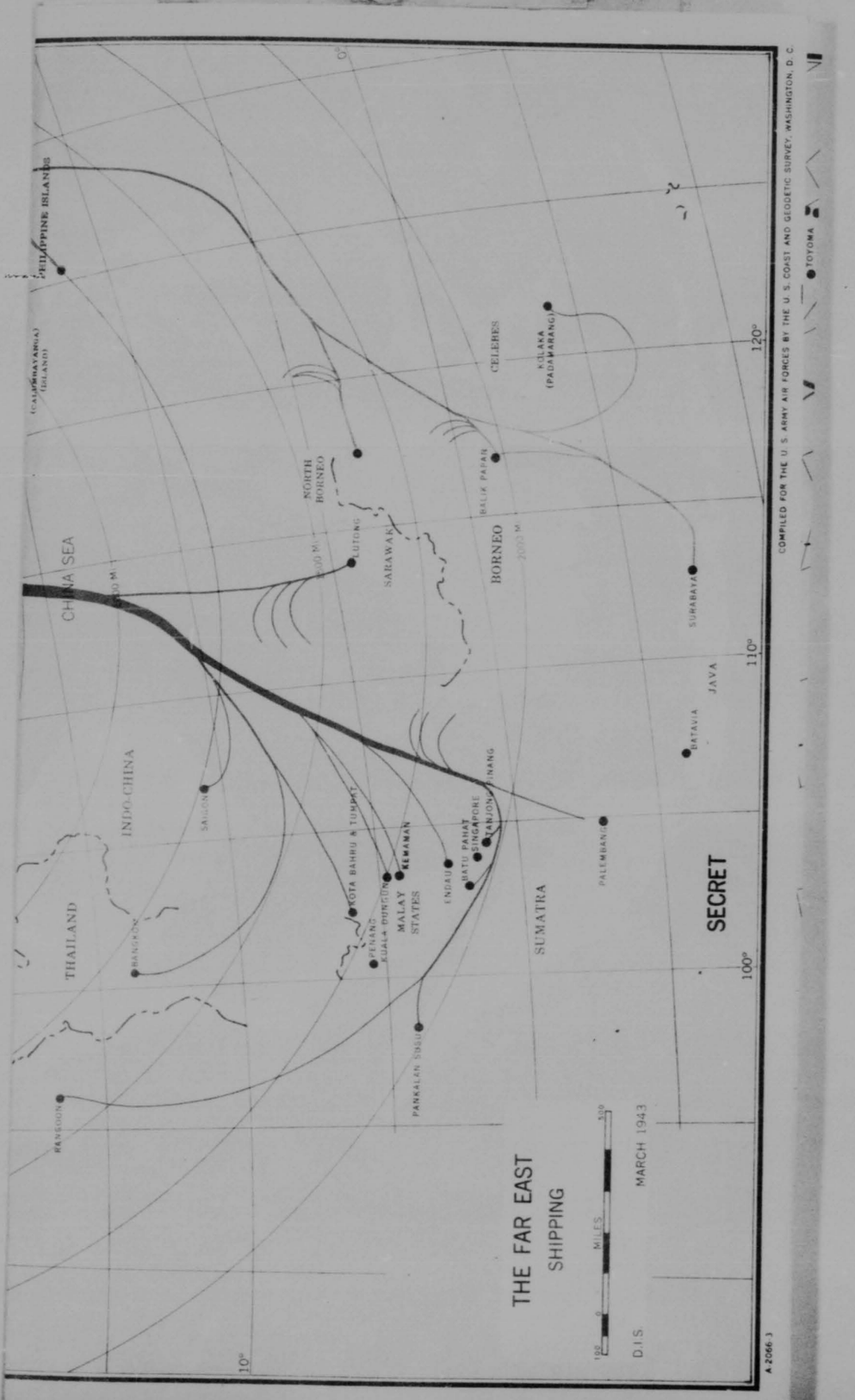


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JAPANESE SHIPPING

Shipping is one of the most vital links in Japan's war economy, and is the link presently most exposed to air attack.

This situation is significant with reference to operations from presently held China air bases. A radius of approximately 1000 miles from Wanan includes a number of important harbors where large numbers of ships will be found loading coal, iron ore and other commodities indispensable to the Japanese war effort. Destruction of shipping concentrated in these ports will directly affect the war production of major industrial plants at a considerably greater distance.

Vessel appearance in these harbors is not intermittent. The flow of basic commodities from the ports is on a large scale, and in many cases is of a highly hand-to-mouth character. The ships are not isolated, fleeting targets. Alongside quays and docks and moored in roadsteads for days at a time while loading or discharging cargo, these vessels are relatively fixed objectives.

A 1000 mile radius will also include the inner sea lanes most frequently used by Japanese ships engaged in transporting raw materials from, and military supplies and troops to, the South Pacific. Also within this radius are substantial ship building and repair facilities which would assume increased importance as result of successful China-based attack on shipping.

Such attack on shipping will directly affect Japan's war potential in one or more of the following ways:

1) Increase the rate of ship losses, which already exceeds replacement capacity;

2) Force shipping into more circuitous lanes -- reducing the effectiveness of the merchant fleet, and exposing ships re-routed east of Taiwan to submarine attack not encountered between Taiwan and the China coast;

3) Force resort to slow, heavily-escorted convoys, decreasing the effectiveness of the merchant fleet tonnage;

4) Reduce the flow of essential raw materials;

5) Interfere with military operations in the South Pacific combat areas.

Principal factors in the Japanese shipping position, which are discussed in detail in the following sections, are:

1) Origin, volume and flow of basic commodities, and the resultant concentrations of ships;

2) The Japanese merchant fleet position, i.e., the fleet available (allowing for war losses, acquisitions, and construction) to move the required volume of basic commodities;

3) Ship building and repair facilities, which determine ability to maintain the required merchant fleet position.

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COMMODITY MOVEMENTS AND SHIP CONCENTRATIONS

Japan's war effort depends upon the seaborne movement of a vast tonnage of raw materials. Japan has available to her sufficient supplies of food (principally rice) and of most raw materials. A major proportion of these commodities must be shipped, either from overseas ports to the Japanese Islands, or between the various harbors of the Japanese Islands themselves.

In order to transport the requisite amounts of basic raw materials and food from their sources to centers of consumption, in 1943 Japan must ship a total cargo of approximately 69,000,000 tons. This figure represents the amount which she must obtain from overseas and which she must move from one place to another within the Japanese Islands in order to ensure the industrial production requisite for the present level of war effort. Shipments of many miscellaneous semi-manufactured and finished goods, military supplies, and troops are excluded. Of the total cargo of 69,000,000 tons, 77% is represented by coal, iron ore and pig iron, and 85% by coal, iron ore, pig iron, and petroleum.

The general geographical distribution of shipments is as follows:

a) 35,265,000 tons, or 51% of the total, originate in ports in Japan Proper and go to Japanese destinations.

b) 20,628,000 tons, or 30%, originate in Chosen, Manchukuo, China and Taiwan.

c) Thus 55,893,000 tons, or 81% of total shipments to Japan originate within the "inner zone". (Japan, Chosen, Manchukuo, North China and Taiwan)

d) The remaining 13,147,000 tons, or 19%, originate in latitudes south of Taiwan. While this tonnage is relatively small it includes the bulk of Japan's supplies of non-ferrous ores and metals, and petroleum. Of all the petroleum shipped from Indies ports only one-third will go to Japan Proper; two-thirds will go to other destinations in the War East, principally to combat zones.

Table I on the following page shows the source of each basic commodity, giving the estimated amounts coming from every country and from each major harbor during 1943. While Japan has stockpiles of many materials sufficient to last from 1 to 3 years or more, it is believed that she will endeavor to maintain and increase these and that their presence will not cause a reduction in the movement of commodities until the military situation or a shipping stringency causes a curtailment. In any case, no inventories of iron ore and coal, which constitute the bulk of shipments, have been accumulated and their consumption is on a hand-to-mouth basis. Any interruption of their flow is an immediate blow to Japanese industry.

The movement of 69,000,000 tons of cargo will result in a certain number of ships being in each harbor from which commodities flow and in each harbor at which they arrive, at any one time. On the basis of the commodity shipment statistics, and supplementary data not included in this report, the table presented below has been constructed. This table shows the number of ships per week in each harbor, the average size of these ships, and their total tonnage. In order to avoid figures showing a fraction of a ship, a week has been chosen as the unit of time rather than a day. (See Table II.)

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(all figures in metric tons)

PORT	TOTAL	BAUXITE	CHROMIUM	COAL		COPPER
				Coking	Non-Coking	
JAPAN	30,465,300			2,000,000	27,100,000	
Esutoru	800,000			600,000		
Fukuoka	1,000,000				1,000,000	
Honto	600,000			400,000		
Karatsu	1,000,000				1,000,000	
Kushiro	1,000,000				1,000,000	
Maoka	700,000			500,000		
Miike	3,100,000				3,100,000	
Moji	2,600,000				2,600,000	
Muroran	5,500,000				5,500,000	
Okha a)	131,600					
Otaru	2,500,000				2,500,000	
Otamari	500,000			300,000		
Shikuka	400,000			200,000		
Ube	1,400,000				1,400,000	
Wakamatsu	9,000,000				9,000,000	
Yokohama	233,700					
CHOSEN	5,021,200				2,000,000	
Chinnampo	2,805,000				2,000,000	
Fusan	146,200					
Konan	270,000					
Nashin	500,000					
Seishin	1,300,000					
MANCHUKUO	3,935,000				1,200,000	
Dairen	3,623,750				1,200,000	
Tashito b)	371,250					
CHINA	9,026,200			5,300,000	1,200,000	
Chinwangtao	3,600,000			3,300,000	300,000	
Tientsin	1,400,000				350,000	
Tsingtao	2,900,000			2,000,000	550,000	
Yangtze	1,126,200					
TAIWAN	2,585,000				500,000	100,0
Kealung	1,671,000				500,000	100,0
Niitaka	237,000					
Takao	677,000					
PHILIPPINES	1,560,000		180,000			
Masinloc	180,000		180,000			80,0
Pambujan Sur (Samar)	200,000					
Paracale (Calumbayanga Is)	1,100,000					
San Fernando La Union	80,000					
INDO-CHINA	2,284,900				1,300,000	80,0
Campha	500,000				500,000	
Haipnong	249,900					
Hongai	500,000				500,000	
Port Redon	300,000				300,000	
Saigon	735,000					
THAILAND	319,400					
Bangkok	319,400					
MALAYA	1,522,000	100,000				
Batu Pahat	450,000	100,000				
Endau	100,000					
Kemaman	100,000					
Kota Bahru & Tumpat	172,000					
Kuala Dungun	700,000					
NETHERLANDS EAST INDIES	6,272,800	300,000				
Balikpapan	391,400					
Kolaka (Padamarang)	180,000					
Lutong	2,536,400					
Palembang	1,269,000					
Pankalan Susu	771,900					
Surabaya	560,500					
Tandjong Pinang	300,000	300,000				
Tarakan	263,600					
BURMA	219,000					
Rangoon	219,000					
TOTAL TONNAGE ASSIGNABLE TO SPECIFIED HARBORS	63,270,800	400,000	180,000	7,300,000	33,300,000	180,0
ADD: NON-ASSIGNABLE TONNAGE	5,769,000	100,000			4,800,000	
JAPAN	4,800,000				4,800,000	
CHINA	54,000					
PHILIPPINES	60,000					
MISCELLANEOUS SOURCES	855,000	100,000 c)				
GRAND TOTAL	69,039,800	500,000	180,000	7,300,000	38,100,000	180,0

a) Russian Sachalien
b) In Korea, just across Manc
c) Java

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JAPAN 1943 - - COMMODITY SHIPMENTS FOR ESSENTIAL INDUSTRIAL REQUIREMENTS BY PORT OF ORIGIN

COTTON	FERTILIZER Nitrogenous	FERTILIZER Phosphate	FERTILIZER Soybean	IRON ORE & PIG IRON Iron Ore	IRON ORE & PIG IRON Pig Iron	LEAD	LUMBER PAPER PULP	MANGANESE	NICKEL	PETROLEUM	RICE	RUBBER	SALT	SUGAR	ZINC
	200,000						1,000,000			165,300					
							200,000								
							200,000								
							200,000								
										131,600					
							200,000								
							200,000								
	200,000														
	300,000			2,080,000	495,000					33,700					
	30,000			280,000	495,000						146,200				
	270,000										146,200				
				500,000											
				1,300,000											
	80,000		850,000	180,000	1,085,000										
	80,000		750,000	180,000	813,750								600,000		
			100,000		271,250								600,000		
200,000		80,000		1,100,000	100,000										
											146,200		900,000		
150,000				200,000	100,000										
50,000													600,000		
		80,000		900,000									300,000		
)0											146,200				
)0											585,000		200,000	1,200,000	
											351,000			720,000	
											117,000			120,000	
)0				1,300,000							117,000		200,000	360,000	
				200,000											
)0				1,100,000											
		160,000						3,000					100,000		61,900
		160,000						3,000					25,000		61,900
											585,000	75,000	75,000		
											219,400		100,000		
											219,400		100,000		
				1,400,000				22,000							
				350,000											
				100,000											
				100,000											
				150,000				22,000							
				700,000											
									180,000	5,692,800			100,000		
									180,000	391,400					
										2,536,400					
										1,269,000					
										771,900					
										460,500			100,000		
										203,600					
						80,000			5,900		73,100				60,000
						80,000			5,900		73,100				60,000
)0 200,000	580,000	240,000	850,000	6,060,000	1,680,000	80,000	1,000,000	25,000	185,900	5,858,100	1,754,900	75,000	2,000,000	1,200,000	121,900
		750,000				54,000		65,000							
						54,000									
		750,000 d)						60,000							
)0 200,000	580,000	990,000	850,000	6,060,000	1,680,000	134,000	1,000,000	90,000 e)	185,900	5,858,100	1,754,900	75,000	2,000,000	1,200,000	121,900

churian border.

c) Mandated Islands & Carolines: 60,000; Indo-China & Hainan: 40,000

d) Christmas Is., Luchu & Mandated Islands.

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TABLE II.

SELECTED HARBORS ARRANGED ACCORDING TO SHIPS IN PORT PER WEEK

HARBOR	SHIPS IN PORT PER WEEK	AVERAGE SIZE (TONS)	TOTAL TONNAGE PER WEEK	DISTANCE FROM WANAN						
				0-500	500-750	750-1000	1000-1250	1250-1500	1500-1750	1750&over
Takamatsu	630	2,400	1,512,000				x			
Osaka	364	2,300	837,200					x		
Tokyo	336	2,100	705,600						x	
Moji	144	3,700	532,800				x			
Nagoya	140	2,100	294,000					x		
Muroran	120	2,200	264,000							x
Yokohama	102	5,000	510,000						x	
Yangtze	96	3,600	345,600			x				
Dairen	66	4,700	310,200				x			
Tsingtao	61	3,700	225,700				x			
Miike	60	2,000	120,000					x		
Ube	52	1,000	52,000					x		
Otaru	48	2,000	96,000							x
Keelung	48	4,000	192,000	x						
Chinwangtao	45	4,700	211,500				x			
Chinnampo	43	5,000	215,000					x		
Karatsu	38	2,000	76,000					x		
Fukuoka	38	2,000	76,000					x		
Kuala Dungun	37	5,000	185,000							x
Shimizu	35	2,000	70,000						x	
Paracale (Calambayanga)	34	5,000	170,000					x		
Esutoru	25	2,500	62,500						x	
Maoka	22	2,500	55,000						x	
Tientsin	21	3,000	63,000				x			
Lutong	20	10,000	200,000					x		
Takao	20	4,000	80,000	x						
Honto	19	2,500	47,500						x	
Kushiro	19	2,000	38,000						x	
Otamari	15	2,500	37,500						x	
Seishin	15	5,000	75,000				x			
Saigon	14	5,000	70,000				x			
Batu Pahat	14	5,000	70,000						x	
Palembang	13	10,000	130,000						x	
Shikuka	12	2,500	30,000						x	
Bangkok	12	5,000	60,000				x			
Tandjong Pinang	9	5,000	45,000						x	
Campha	8	5,000	40,000		x					
Hongai	8	5,000	40,000		x					
Konan	7	3,000	21,000				x			
Tashito	7	4,000	28,000				x			
Rashin	6	5,000	30,000					x		
Niitaka	6	4,000	24,000	x						
Masinloc	6	5,000	30,000			x				
Endau	6	5,000	30,000						x	
Kota Bahru-Tumpat	6	5,000	30,000					x		
Kolaka (Padanarang)	6	5,000	30,000						x	
Pankalan Susu	6	10,000	60,000						x	
Surabaya	5	5,000	25,000						x	
Port Redon	5	5,000	25,000	x						
Haiphong	4	5,000	20,000	x						
Rangoon	4	5,000	20,000				x			
Kemaman	3	5,000	15,000						x	
Balikpapan	3	10,000	30,000						x	
San Fernando La Union	2	5,000	10,000		x					
Fusan	2	3,000	6,000			x				
Tarakan	2	10,000	20,000					x		
Pambujan Sur	1	5,000	5,000				x			

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JAPANESE SHIPPING
(Cont'd)

The method of calculating the number of ships in port per week is as follows, using the harbor of Konan (Chosen) as an example.

1) From Konan 270,000 tons of cargo are shipped per year, or 720 tons per day.

2) The average size of ship appearing in Konan harbor is approximately 3000 tons deadweight.

3) Therefore the removal of 720 tons of cargo per day will require $\frac{720}{3000}$ or .247 ships per day.

4) Average loading time at Konan is four days.

5) Average number of ships in port per week equals the number of ship arrivals per day (.247) x loading time (4) x days per week (7). For Konan the equation reads:

Ships in port per week = .247 x 4 x 7 = 6.9 or in round numbers 7 ships in port per week.

6) The number of ships in port per day equals the number per week divided by 7.

Since the effective deadweight tonnage of a ship (the weight of cargo it can carry) is somewhat less than its deadweight tonnage (weight of cargo, fuel and stores) the use of the latter tonnage in this calculation serves to understate the number of ships required.

The harbors of Osaka, Tokyo, Yokkaichi, Nagoya, Yokohama, Moji, Shimizu and the Yangtze are points of destination and to allow for this fact a calculation similar to the above is made in estimating their ship concentrations.

The figures in Table II are estimates. They are subject to certain modifications, some of which are discussed under seasonal movements of commodities, and military shipping. The figures in the table are based on assumption of a uniform flow of commodities throughout the year. In actual fact the flow may vary considerably, due to military contingencies and the relative strength of various demands upon the available supply of bottoms. As shown above two of the factors employed in calculating the size of weekly ship concentrations are the average tonnage of the vessels appearing in each port and the average time necessary to load these vessels. The data for each harbor on these two factors is based upon peace-time experience and an estimated current pattern of use of the merchant fleet. Actual Japanese practice will obviously cause deviation from the estimates used here, and these deviations will cause the sizes of ship concentrations found in War Eastern harbors to vary from those presented in Table II. The purpose of the table is to provide a measure of the relative importance of these harbors, and to indicate (with allowance for the factors mentioned) an average expectancy.

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Seasonal Factors in Ship Concentrations

Commodities

The figures in Table II showing the number of ships per port are subject to modification in certain cases because of the seasonal movement of rice and sugar. Principal ports in this category are Rangoon, Bangkok, Saigon, and the Taiwan ports of Keelung, Hiitaka and Takao.

There is a seasonal pattern in the export of rice from all of these harbors, and in the movement of sugar from the three Taiwan ports. The following tabulation shows the figures from Table II for all commodities for these 6 ports, and these figures adjusted to reflect seasonal production and export of rice and sugar.

SHIPS IN PORT PER WEEK

Adjusted for Seasonal Factors

Month	J	F	M	A	M	J	J	A	S	O	N	D	From Table II
Rangoon (Burma)	5					4				3			4
Bangkok (Thailand)	6					19				5			12
Saigon (Indo-China)	10			23				12					14
Keelung (Taiwan)	63			42		51				31			48
Takao (Taiwan)	26			17		21				8			20
Hiitaka (Taiwan)	8			5				4					6

NOTE: Shaded areas are peak periods

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Commodities
(Cont'd)

The increase in the number of ships in these ports during the rice and sugar export seasons is not great enough to materially reduce ship concentrations to be expected in other harbors during these same seasons. Considering all these ports, only 60 more ships per week are required during the season of greatest movement of these commodities than are required during the period of least movement. This total is an insignificant percentage of the total number of ships in port per week for all harbors in the Far East throughout the year -- approximately 1300.

In addition to the above harbors, rice moves from Fusan and from the Yangtze. However, the tonnages involved are so small in relation to the total tonnage of all commodities moving from the Yangtze that the seasonal effect of rice movement is nominal. While rice is the only major commodity moving in bulk from Fusan, this harbor is constantly filled with ferry traffic between Chosen and Japan and the shipment of only 146,000 tons of rice from this point will employ a small number of ships compared to the total using the port.

Weather

Winter weather conditions obtaining between November, December and March curtail in varying degree the number of ships in the northern ports in Karafuto and Hokkaido. These ports are Esutoru, Honto, Kushiro, Mooka, Muroran, Otaru and Otaru. While the harbors are generally usable at this season, high winds and ice conditions will undoubtedly reduce the weekly ship concentrations in these ports during the winter. This seasonal factor cannot be evaluated quantitatively; the figures in Table II are on the basis of uniform flow throughout the year.

In the case of the east coast Malayan harbors of Kuala Dungun and Endau it is possible to allow for the effects of the NE monsoon which blows with great regularity. The monsoon renders these harbors unusable from November through March each year. The harbors are too shallow for ocean-going vessels and cargo is loaded from lighters in the roadstead; heavy swells make this impossible during the NE monsoon season. No shipping will be found from November through March. In Table II ship concentrations for Kuala Dungun and Endau are calculated on the basis of 7 months, April through October.

To a lesser degree the NE monsoon will reduce the ship concentrations in Kota Bahru-Tumpat and Kemaman.

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MILITARY SHIPPING

The amount of shipping which Japan presently requires to maintain her ground and air forces throughout the Far East is small relative to the sea-borne transport of basic commodities to Japan Proper.

To maintain these forces, it is indicated that approximately 155,000 tons of military supplies per week must be transported. This is based on the enemy order of battle for March 1943, and an estimate of over-all Japanese military shipping requirement of 1 gross ton per man per 60 days.

This 155,000 tons compares with approximately 1,327,000 sea-borne tons per week of commodities essential for the maintenance of the present Japanese war effort. The movement of military supplies (excluding initial invasion) thus represents about 10%, and the movement of industrial commodities about 90% of total shipping requirements.

In all areas except the S.W.P. combat zone (New Guinea, New Britain, the Solomons) and the Aleutians, the number of ships arriving from Japan to load cargoes of basic commodities is substantially in excess of the number of ships required to transport military supplies to these areas. The number of ships arriving from Japan in Rangoon, Saigon and the Yangtze to pick up lead, rice and iron ore is greater than the number required to bring military supplies into these harbors. In general, therefore, the necessity of transporting military supplies does not mean a corresponding tonnage in addition to the ships going out light to pick up commodities, and can be expected not to materially alter the number of ships per week in the harbors listed in Table II, although unloading of military supplies will increase time in port.

Under present conditions, military supplies will not move into certain ports (such as Kuala Dungun, Pakanbaru, Lutong, etc.) but may move in considerable volume into such ports as Singapore, Penang, Hong Kong through which the outward movement of commodities is not significant.

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SELECTED SHIP CONCENTRATIONS

(RELATION TO CHINA BASE)

Seventeen harbors from Table II are listed as key ports, because of the large amount of shipping which can be expected in them at any one time, and because of the importance of the commodities handled. These harbors are:

Port	Country	Port	Country
Yokkaichi-Yawata	Japan	Tsingtao	China
Osaka	Japan	Miike	Japan
Tokyo	Japan	Keelung	Taiwan
Moji	Japan	Chinwangtao	China
Nagoya	Japan	Chinnampo	Chosen
Muroran	Japan	Kuala Dungun	Malaya
Yokohama	Japan	Parracale	Philippines
Yangtze	China	(Calamboyanga Is.)	
Dairen	Manchukuo	Lutong	British Borneo

(Priority ports are underlined)

Within 500 miles of Yunan operations base is the Taiwan port of Keelung, from which rice, sugar, non-coking coal and copper are the chief exports. This radius also includes the ports of Takao and Niitaka on Taiwan, and a small part of the Yangtze.

A 500-750 radius includes most of the Yangtze -- an increasing source of iron ore and a major military transport route. Other harbors in this radius are Cuapha, Hongai, Port Redon, and Haiphong in Indo-China.

The 750-1000 mile radius contains the large Chinese harbors of Chinwangtao and Tsingtao, through which flow steady streams of coking coal, iron ore, cotton, and salt. Dairen is the outlet for Manchurian coal, pig iron, salt, and fertilizer. Although not a key harbor, Tientsin is Japan's chief source of cotton. Other harbors in this radius are Masinloc and San Fernando La Union in the Philippines.

A radius of 1000-1250 miles is required to reach harbors in Japan Proper. Yokkaichi is the busiest harbor in the Far East and over 600 ships will be found here during any week of the year. This is the greatest coal shipping port, and also the destination of many ships bound for Japan. Moji is likewise both the source and destination of large shipments, and Miike is a source of non-coking coal. Considerable pig iron and coal cargoes are moved from Chinnampo in Chosen. Parracale (Calamboyanga Is.) in the Philippines is a harbor for vessels carrying over 1,000,000 tons of high-grade iron ore a year. Lesser harbors in the 1000-1250 mile band are Ube, Fukuoka, Karatsu, Konan, Toshito and Fusan.

Beyond 1250 miles are Osaka, Tokyo, Nagoya and Yokohama, all of which are important destination points; Muroran, a coal port; Kuala Dungun in Malaya (used only in the SW monsoon, April - November), a source of iron ore; and Lutong, in British North Borneo. Lutong is Japan's greatest single source of petroleum, particularly fuel oil, and the 10,000 ton tankers to be found here are extremely valuable ships.

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Listed below are a number of harbors, some of which are not included in Table II, whose importance rests largely on other factors than commodity volume. A brief indication is given of the function of each harbor.

Aomori	Port for ferries between Honshu and Hokkaido.
Batavia	Large N.E.I. harbor; export point for miscellaneous commodities.
Fusan	Port for ferries between Chosen and Japan.
Hakodate	Port for ferries between Hokkaido and Honshu.
Hong Kong	Convoy assembly and ship repairs.
Kagoshima	Possibly a base for naval task forces.
Karenko	Destination port for bauxite and ore.
Nagasaki	Military embarkation point; ferries and miscellaneous shipping to China and Chosen.
Okayama (Uno), Takamatsu	Inland Sea transit points; connections with Shikoku.
Penang	Transit point and submarine base.
Shimonoseki	Military shipping; ferries to Chosen.
Singapore	Large harbor and transit point. Major naval base on north side of island.
Surabaya	Naval base; miscellaneous shipping.
Toyama	Destination of much bauxite ore.
Yokkaichi	Naval supply depot.

The accompanying Shipping map shows all ports discussed in this study, and the flow of commodities from each of them is indicated in broad outline. A special section of the report includes descriptions of harbor characteristics, harbor charts and available photographs.

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MERCHANT FLEET POSITION

To move the commodity tonnages indicated in the preceding section, plus such military shipping as will require additional vessels, it is estimated that Japan in 1943 will require a merchant fleet of 4,500,000 to 5,000,000 gross tons.

JAPANESE SHIPPING POSITION AS OF JANUARY 1, 1943

Tonnage available Dec. 1, 1941 (Vessels of 100 gross tons or over, including those under Chinese and Manchurian flags, but excluding fishing craft, barges, etc.)	6,700,000	
New construction to Jan. 1, 1943	320,000	
Axis and French tonnage available	250,000	
Allied tonnage captured	250,000	
Allied sunken vessels raised and repaired	80,000	
TOTAL		7,600,000
Vessels sunk by Allied action to Jan. 1, 1943	1,600,000	
Ordinary marine losses	70,000	
Vessels seriously damaged in the War	400,000	
Vessels laid up for ordinary repairs	400,000	
Vessels captured which do not add to Japanese shipping potential (i.e. in essential local trade, etc.)	80,000	
Ferries, floating armories, etc. not suitable for ordinary commercial use	80,000	
TOTAL		2,650,000
NET TOTAL		4,950,000

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MERCHANT FLEET POSITION

(Cont'd)

Japan's shipbuilding capacity does not appear adequate to better her ship tonnage position in the near future.

As shown in the preceding table, Japan's losses up to January 1, 1943 were approximately 1,600,000 tons of merchant shipping. Estimated new construction for this period was 320,000 tons. Merchant ship construction for 1943 is estimated to be approximately:

Steel ships	650,000 gross tons
Wooden ships (in terms of steel ship efficiency: 3 tons of wood = 1 ton of steel)	200,000 gross tons
TOTAL	850,000 gross tons

Reference is made to the section on Naval Bases and Shipyards.

It is evident that, despite an accelerated program of new construction, Japan's current rate of ship loss exceeds her replacement capacity. Any additional losses imposed on Japan through air attack from China bases will further increase the ratio of loss to replacement.

In event of sufficient increase in shipping losses on the long South Pacific hauls and/or major change in the military situation, the Japanese alternative would be withdrawal toward or into the "inner triangle" northward from Taiwan. This would, however, have no appreciable effect on the shipment of commodities within the inner zone, which is estimated to currently represent approximately 80% of total Japanese seaborne commodity transport, or on the ship concentrations in the northern ports.

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April 1943 SECRET

NAVAL BASES AND SHIPYARDS

CHINA BASED OPERATIONS

With the exception of the Shanghai dockyards (and possibly those at Hong Kong), Japan's important shipbuilding facilities are located over 1000 miles from the Manan base.

Within 1000 miles from this base, however, are found an estimated 29% of the total drydock footage available to Japan, 14% of the floating repair dock footage and over 66% of the sizable patent slipways. Although many ship repairs (e.g. top deck and superstructure) can be made without the use of drydocks, any major damage or thorough overhauling requires the use of a repair dock - particularly for naval ships. The destruction of the repair facilities within range of China bases would make it necessary for Japanese ships damaged off the China Coast or in the SW Pacific to travel a much greater distance to find major repair facilities.

Within 500 miles of Manan are found approximately 10% of the repair dock capacity available to Japan. Most of this capacity is at Hong Kong.

Within a radius of 750 miles of Manan are the important repair docks and building ways at Shanghai, as well as the floating docks at Haiphong.

Within a radius of 1000 miles of Manan are also the repair docks at Tientsin, Tsingtao, Toku and Port Arthur.

A radius of 1250 miles is required to reach a significant portion of Japan's shipbuilding and repair capacity. Four key yards in this radius, including the naval bases of Sasebo and Kure and the shipyards at Nagasaki, account for about 18% of shipbuilding capacity and over 25% of marine engine building capacity, as well as a significant percentage of repair capacity.

A radius of 1500 miles includes the bulk of Japan's shipbuilding and repair capacity, including the key Kawasaki Dockyard at Kobe which alone has 18% of shipbuilding and 20% of marine engine building capacity. The total capacity included within a 1500 mile radius is about 70% of Japan's shipbuilding facilities and a comparable portion of her repair facilities.

A radius of 1750 miles will include all but a fraction of Japan's shipbuilding and repair capacity, including the key Yokosuka Naval Base and the Yokohama shipyards.

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April 1943 SECRET

NAVAL BASES AND SHIPYARDS

The indicated dependence of Japan upon water-borne transportation and the comparative stringency of her present shipping position give critical importance to the fact that the drydocks and other repair facilities are necessary in order to maintain and restore vessels damaged in action, and the further fact that the shipbuilding yards have the capacity to launch an annual tonnage equal to one-fifth of the total vessel tonnage of fleet.

It is estimated that the shipbuilding yards in Japan Proper and Japanese-controlled territory are capable of constructing 800,000 - 1,000,000 gross tons of commercial and naval ships in 1943. This figure represents the capacities of the known building yards, as demonstrated by past achievement or reliable information concerning current capacities. (Since the private yards are used extensively for naval construction and repair, the naval yards and commercial yards are considered together in this report.)

It seems clear from information coming out of Japan, however, that the shipbuilding industry was unable to operate at any level close to capacity in 1940 and 1941. The failure of the shipbuilding industry to reach capacity output has been variously attributed to shortages of materials, lack of skilled labor, and delays in transportation of supplies. Undoubtedly, all these factors have been at work in the years 1940-1942, and will persist to some extent in 1943. The drainage of manpower into the armed forces has impaired the output in this as in other industries. Since steel is the principal material used in the shipbuilding industry, the possibility of reaching capacity in the shipyards is dependent upon the availability of an adequate quantity of steel plate. As reference to this Service's report, "Japanese Target Data," will show, the steel rolling mills in the Far East appear to be capable of rolling nearly three times the quantity of steel plate which would be required in the shipbuilding industry if it were operating at a rate of 6 million tons per year. It seems probable, therefore, that any shortage of steel plate cannot be attributed to lack of plate-making capacity, but rather to the general steel shortage which makes it necessary for the Japanese to limit the amount which may be allocated to the shipbuilding industry.

It seems possible that by resorting to wooden ship construction, by stimulating steel plate production, and by assuring an adequate skilled labor supply to the shipbuilding trade, the quantity of shipping tonnage launched in 1943 may exceed that in recent years and may even approach the indicated capacity mentioned above.

The yards engaged in the building and repairing of ships are widely scattered throughout the Far East but those which are significant contributors to the total shipbuilding output are comparatively few. The five leading shipyards, all located in the western half of Japan, account for about 60% of the bottoms launched and 48% of the marine engines built. Since the facilities for repairing vessels are in most cases connected with the shipbuilding yards, the targets important in ship construction are also significant in the repairing branch of the industry. The seventeen key targets listed in the accompanying table appear to construct about 84% of the vessels and 87% of the marine engines, and they perform perhaps 50-60% of the repair work.

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NAVAL BASES AND SHIPYARDS
(Cont'd)

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LIST OF PORTS

CHINA

Chinwangtao
Hong Kong
Laoyao
Tanku (Tientsin)
Tsingtao
Yangtze (Upper River, Shanghai, Woosung)

TAIWAN

Karenko
Keelung
Niitaka
Takao

INDO-CHINA

Camphа
Haiphong
Hongai
Port Redon

MANCHUKUO

Dairen

PHILIPPINES

Manila
Masinloc
Pambujan Sur
Paracale (Calambayanga I)
San Fernando La Union

CHOSEN

Chinnampo
Fusan
Konan
Rashin
Seishin

JAPAN

Kobe-Osaka
Miike
Muroran
Nagasaki
Nagoya
Okayama (Uno-Takamatsu)
Otaru
Shimonoseki Strait
Tokyo-Yokohama
Ube
Yokkaichi

THAILAND

Bangkok

MALAYA

Batu Pahat
Kuala Dungun
Penang
Singapore

EAST INDIES

Balikpapan
Kolaka
Lutong
Palembang
Tandjong Pinang
Tandjong Priok (Batavia)
Surabaya

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April 1943 SECRET

CHINWANGTAO 39° 55' N
(CHINA) 119° 37' E

Chinwangtao Harbor (Target 24) is formed by a breakwater and a pier which enclose an area about 1500 ft long by 1050 ft wide with a wide entrance facing WSW. The breakwater is about 2400 ft long and extends S from the shore and then curves SW. It is a substantial structure of steel piling, sand fill, concrete surfaced, and protected on the outer side by a rock revetment.

The outer part of the harbor is dredged to depths of 23 to 30 ft and a channel of approach is dredged to 24 ft. Any dredge sighted in this vicinity is an important target.

Berthing space can be provided for at least 5 vessels on the inner side of the breakwater only, and both sides of the pier. RR tracks run parallel to shipside. No structures exist on the breakwater or pier and no loading equipment is known to have been installed since Japanese seizure.

Any ships sunk alongside the breakwater would block access to the RR cars and impair the efficiency of the port until wreckage is cleared.

Coal is the chief commodity shipped through Chinwangtao; it is the port for the Kailan Mines. Coal is loaded on vessels directly from RR cars by basket coolie labor.

For shipping, bad weather occurs principally in winter, with prevailing winds from the westward. During the greater part of the year the weather is fine, with prevailing easterly winds.

Chinwangtao Harbor is less frequently obstructed by ice than the Pei Ho (River), and with an effort, the harbor can be kept open during the whole winter.

Chinwangtao lies on the main line of the Tientsin-Mukden RR and permits ready access to the RR for military movements in the event of crowding or closure of Tangku and Taku Bar, port for Tientsin.

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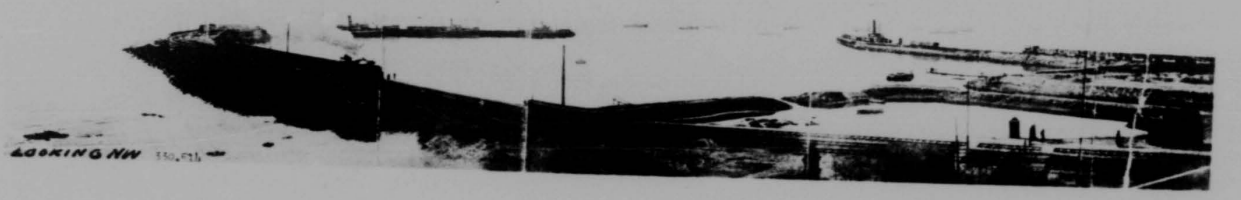
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CHINWANGTAO

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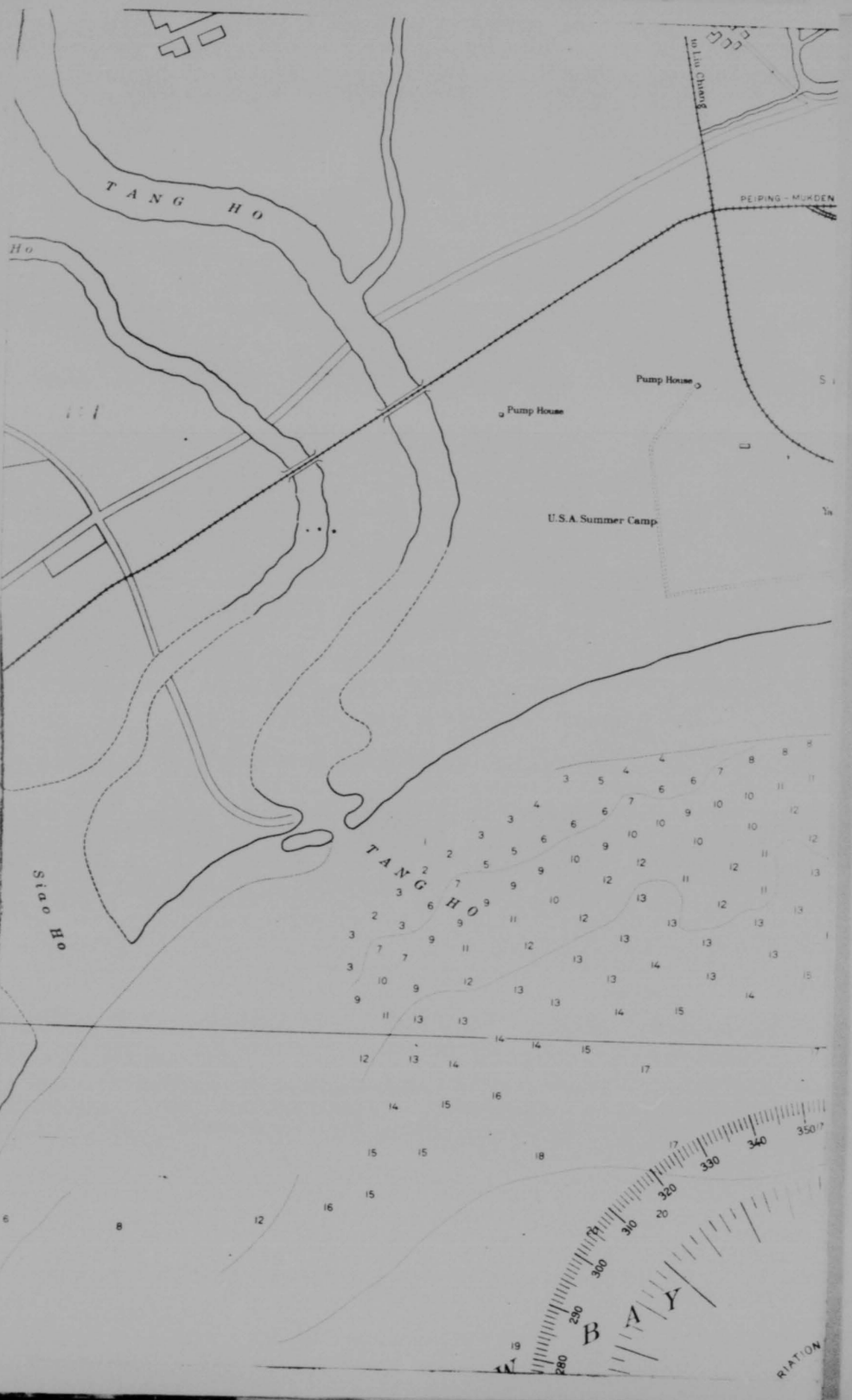


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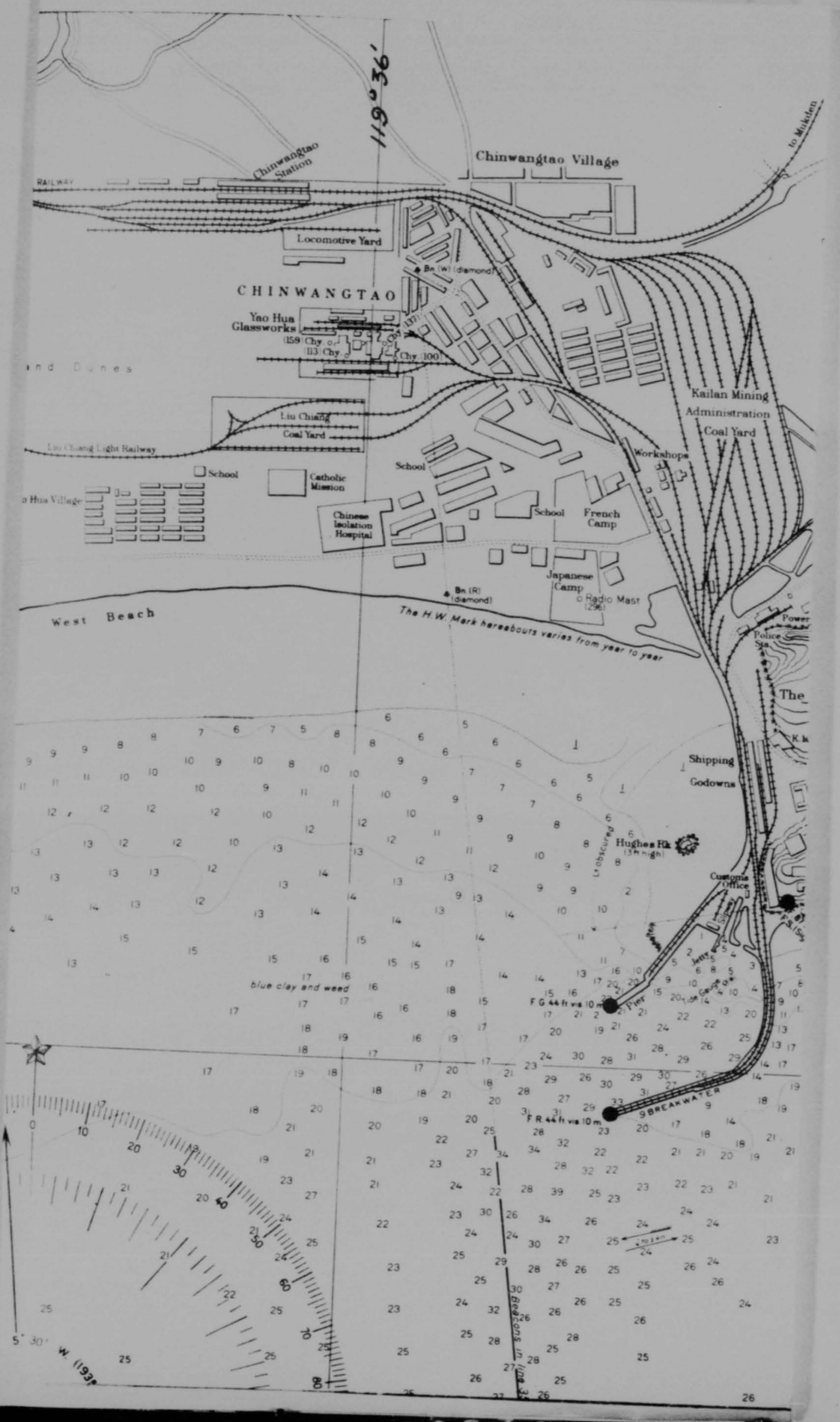
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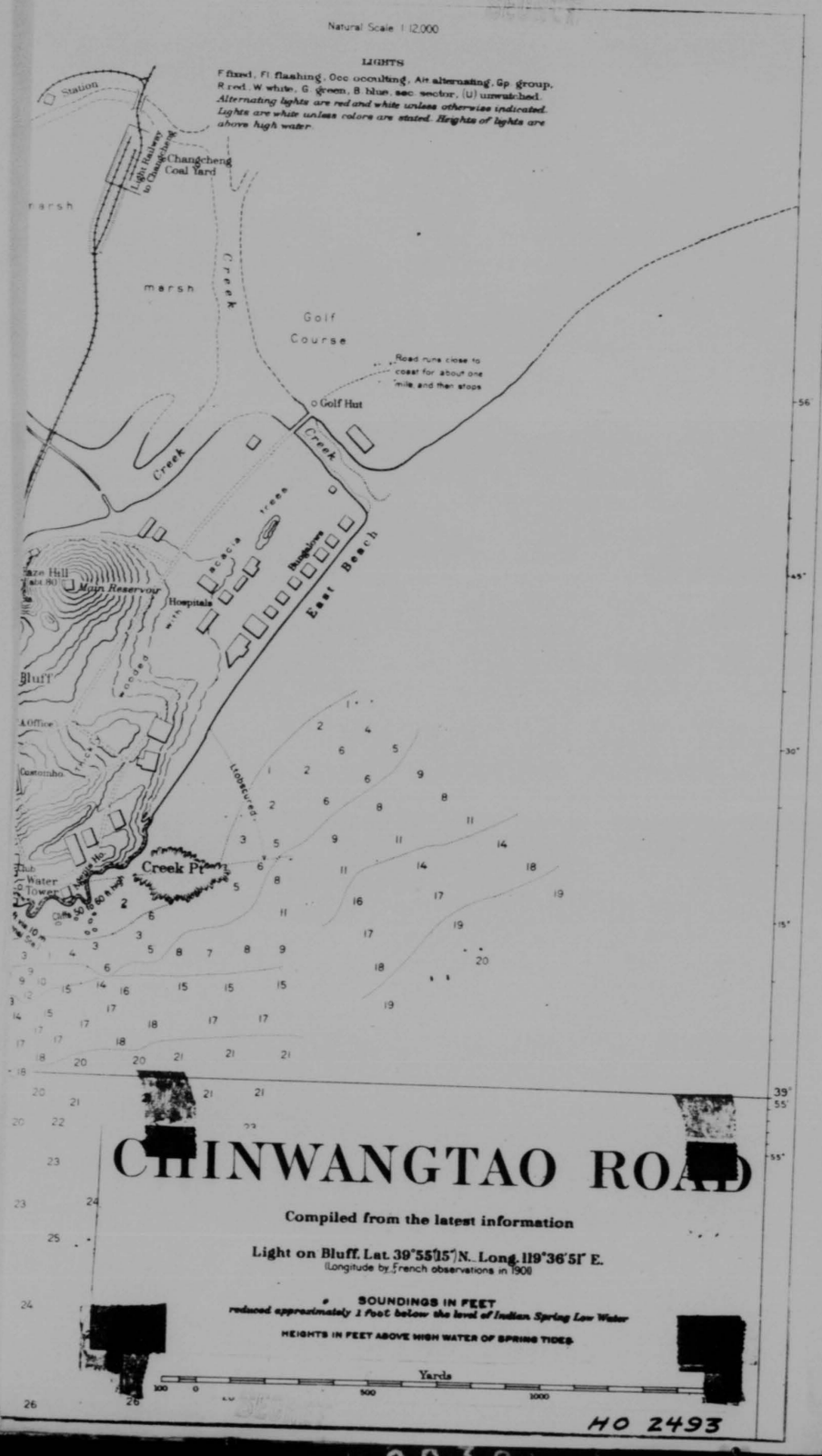


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CHINWANGTAO ROAD

Compiled from the latest information

Light on Bluff. Lat. 39°55'15" N. Long. 119°36'51" E.
(Longitude by French observations in 1908)

SOUNDINGS IN FEET
reduced approximately 1 foot below the level of Indian Spring Low Water

HEIGHTS IN FEET ABOVE HIGH WATER OF SPRING TIDES

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April 1943 SECRET

22° 18' N
114° 10' E

HONG KONG

Hong Kong is not a source of raw materials for Japanese industry. It is, however, a harbor in which great concentrations of shipping have been observed from time to time.

While the shipyards of Hong Kong and Kowloon will account for a number of war-damaged vessels found anchored in the general port area, they will not account for the concentrations reported. It is indicated that Hong Kong and the surrounding waters have been used as convoy control points for north and south bound shipping hugging the coast to avoid submarine attack in the open waters of the China Sea. If the use of the relatively shallow coastal waters can be denied Japanese shipping, the use of lanes more exposed to submarine attack must be resorted to. The waters both to the north and south of Hong Kong present opportunities for the withdrawal of vessels from submarine attack.

If war losses force the replacement of oil-burning vessels heretofore used on southern runs by coal-burning vessels, the greater visibility of the coal burner will be an important factor in its detection by submarines in the lanes beyond the shallow waters of the coast.

While the wharves and warehouses of Kowloon are reported to be used for storage and transhipment of military supplies, it is possible that the extensive air-raid shelters of Hong Kong itself may be used for the same purpose.

Deep draft vessels can be expected at Whampoa on the Pearl River below Canton. The limiting draft on high tide is about 35 feet. Whampoa is an important depot for military supplies.

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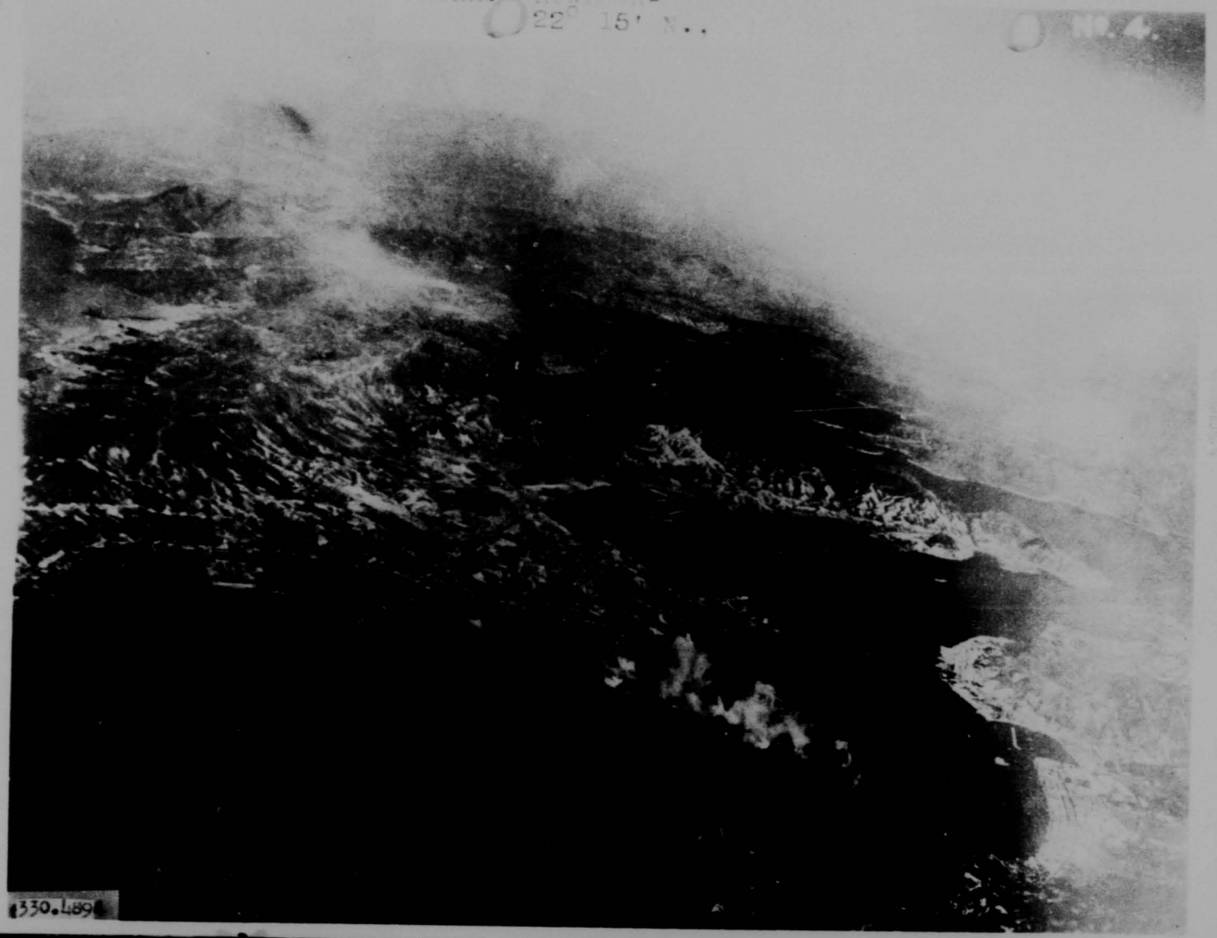
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22° 15' N..

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Hong Kong

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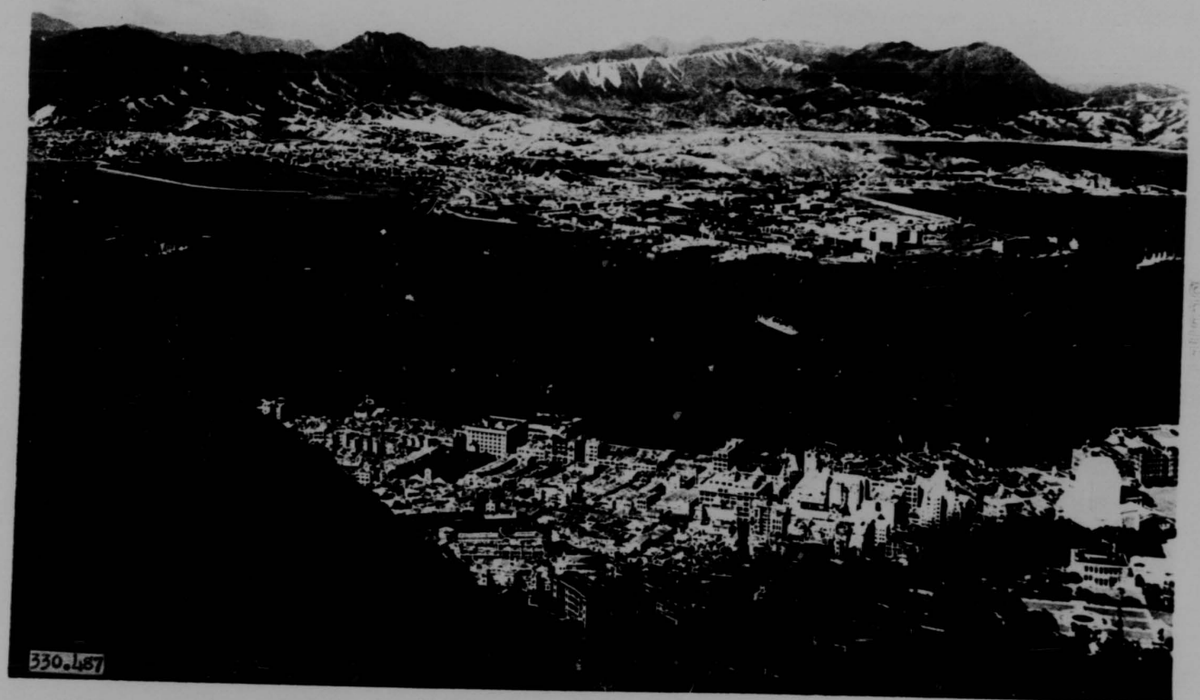
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LOOKING NE

HONG KONG



HONG KONG

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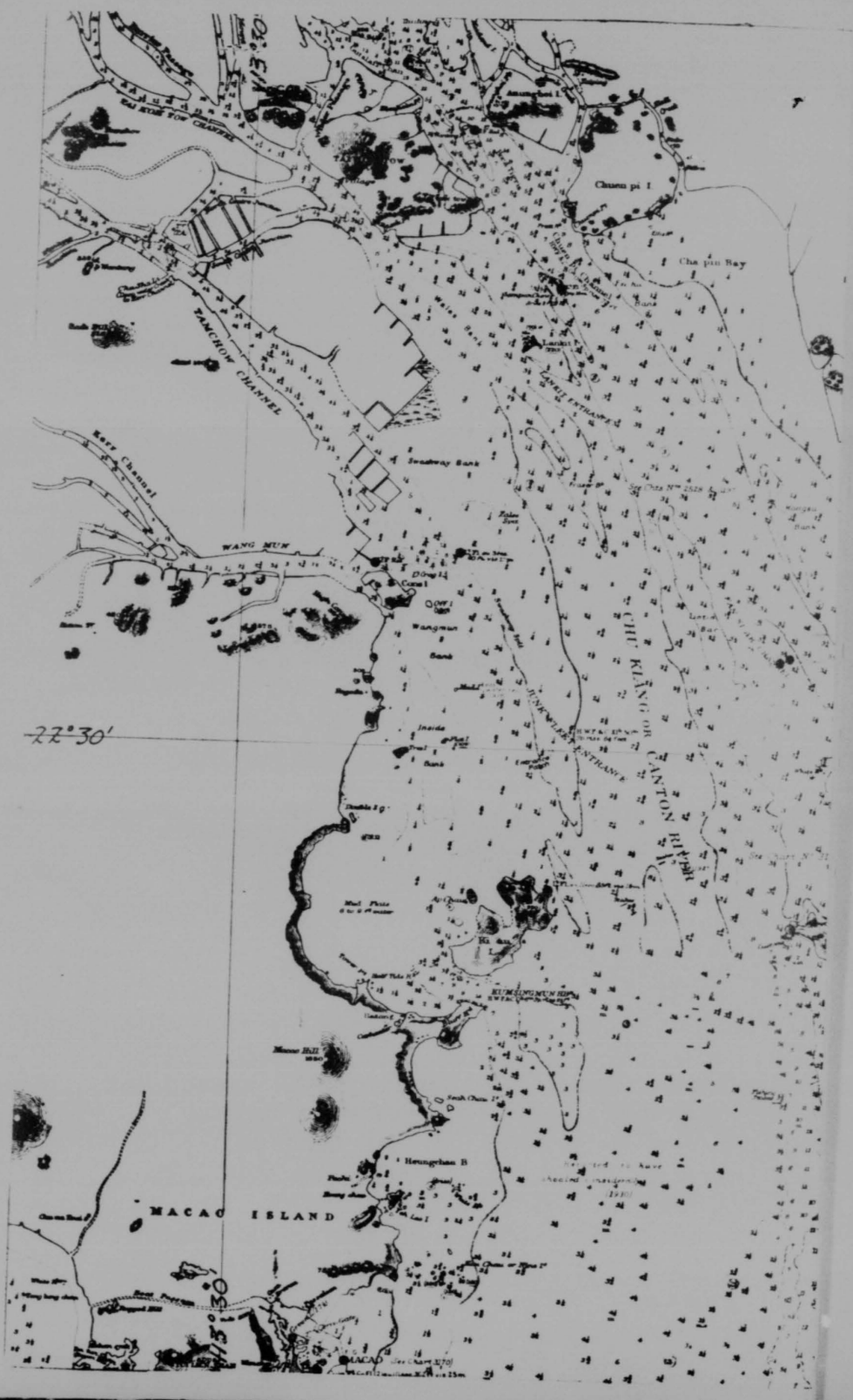


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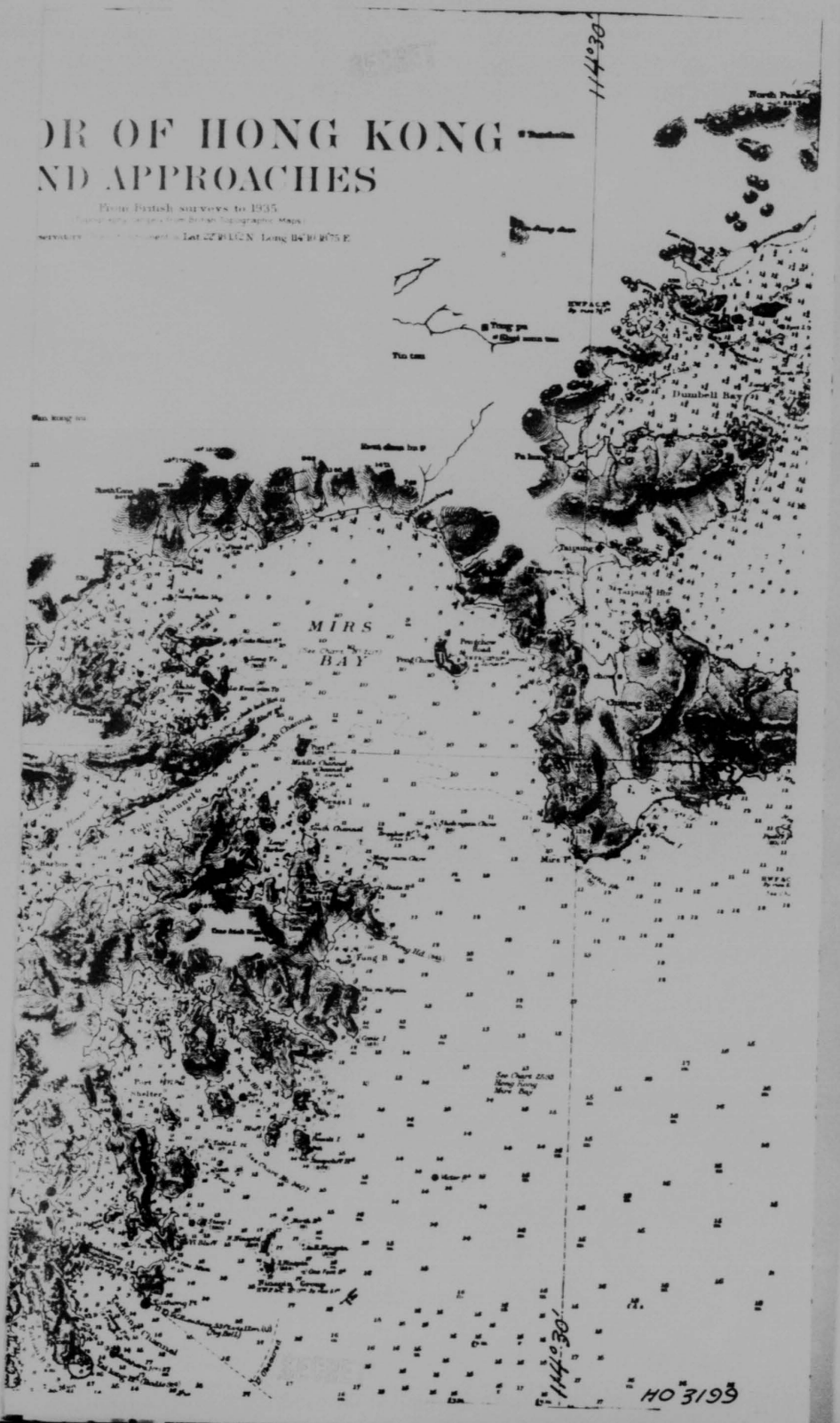
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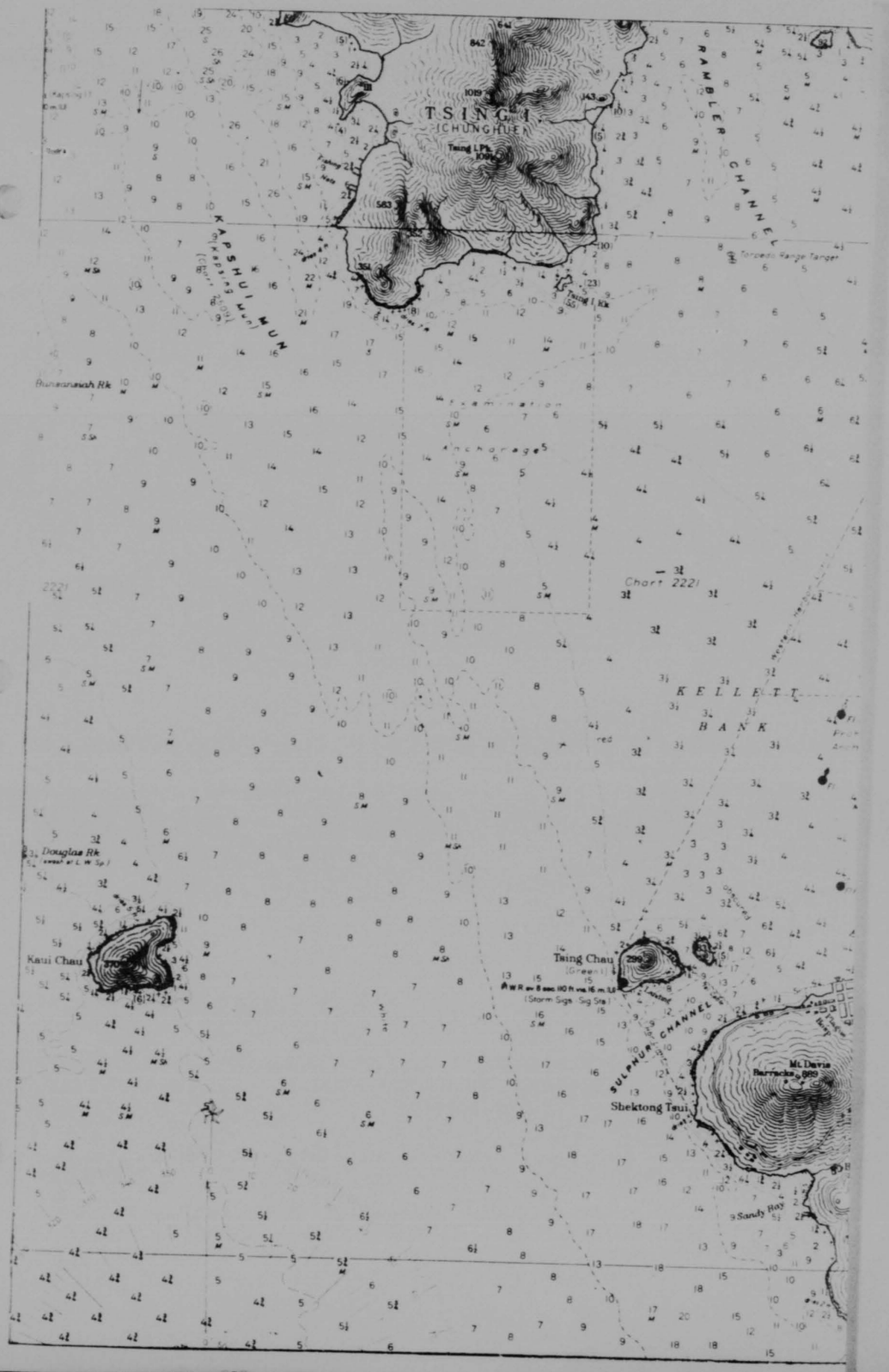


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April 1943 SECRET 34° 44' N
119° 28' E

LAOYAO
(CHINA)

Laoyao (Target 72) is a new port. It is intended to handle the coal mined in southern Shantung Province.

There are two piers 1800 ft long of the "made land type." The East Pier or Pier 1 is designed for general cargo and has a freight shed. The West Pier or Pier 2 is for coal shipments. RR spurs serve both piers to shipside. A mechanical coal loader was originally installed on Pier 1 and presumably will be used when the port is in operation.

Laoyao is a very shallow port and a channel must be dredged for some miles up to the piers. Until this dredging is complete, the port will not be used as lightering has not proven stisfactory.

Dredges in this port are important targets.

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LAO-YAO
(UNDER CONSTRUCTION)

LOOKING N



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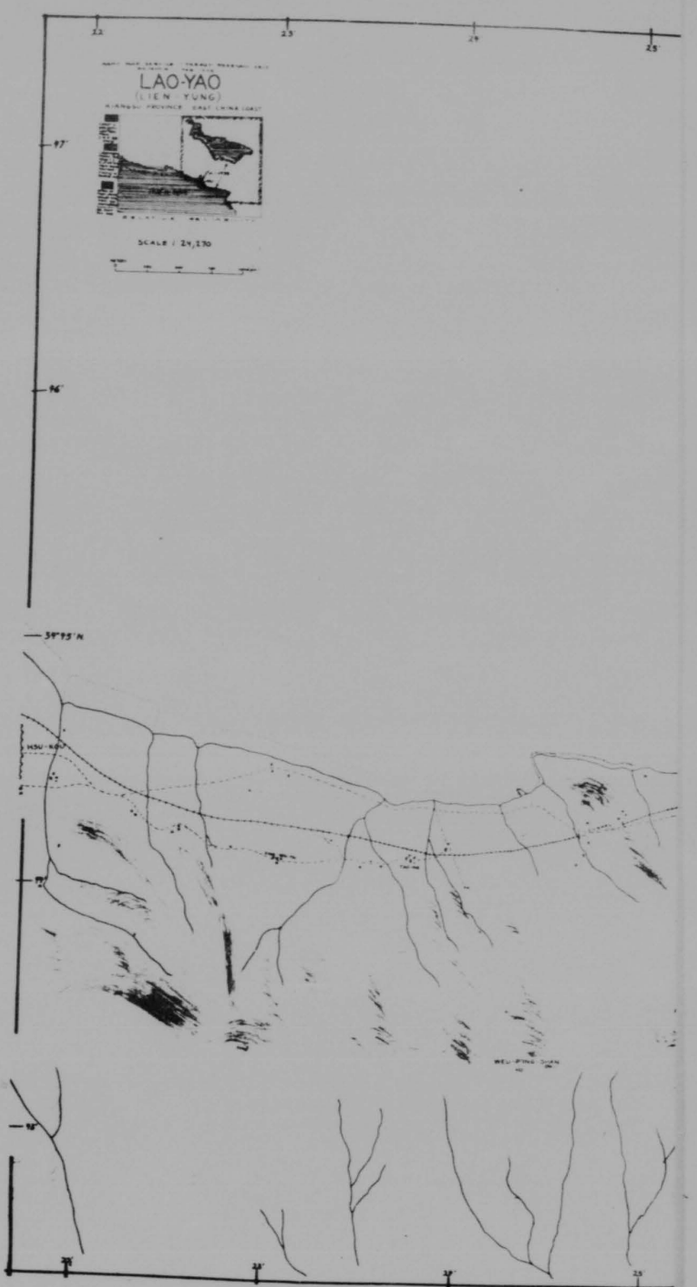
Lao-Yao

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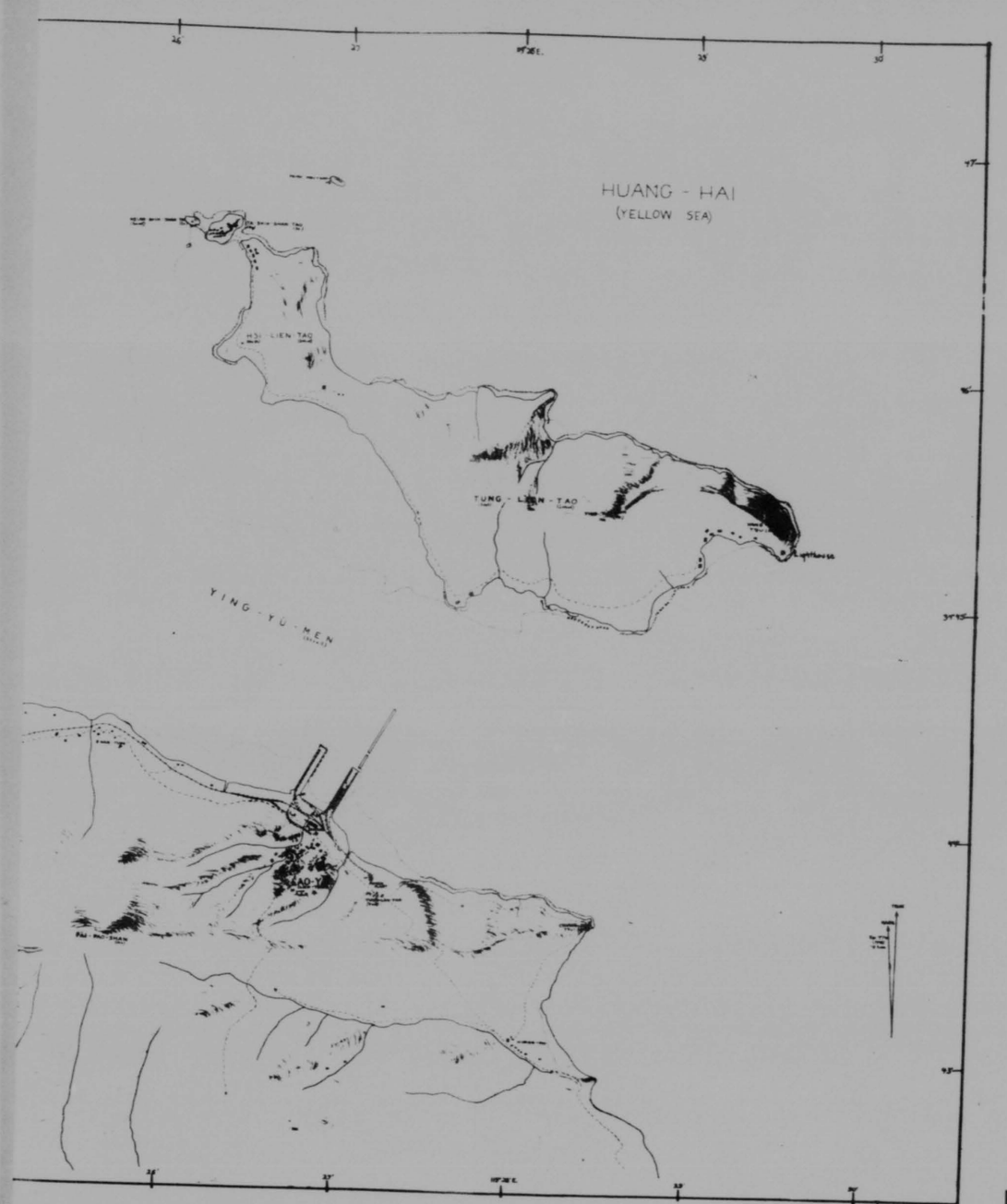
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April 1943 SECRET

TANGKU (TAKU BAR) 39° 55' N
PORT FOR TIENTSIN 119° 37' E

The port of Tangku, just within the mouth of the Pei Ho (River), is the port for Tientsin and its rich hinterland. Tientsin itself is some 30 river miles from the sea up a shallow tortuous river. Tangku is reported to have been improved since Japanese seizure and it is believed that the port is now more accessible to vessels not exceeding 16 ft draft. A turning basin is said to have been dredged and a new wharf for handling iron ore (Target 1) is believed to be in operation.

At Tangku vessels lay broadside against the bank and discharge into freight sheds and onto the open river bank, covering cargo when necessary with tarpaulins. Rail spurs are known to reach shipside at places: they have probably been extended by the Japanese since occupation.

Taku Bar, rather than the dredged depth of the Pei ho at Tangku, is the factor that determines the draft of the vessels that can enter the river. Extensive mud flats that dry at low water front the shores on both sides of the river south to a distance of 3 miles. Through them the river currents have scoured a sufficiently deep channel, a portion of which is known as "Deep Hole," and continuing seaward have deposited the immense quantities of silt that constitute Taku Bar. One, possibly two channels are maintained across this bar by dredging.

Vessels drawing more than 14 ft anchor off Taku Bar; there is a depth of 24 ft about 8½ miles SSE of the river entrance. In winter, when the weather is very severe, vessels cannot anchor off Taku Bar because of the ice.

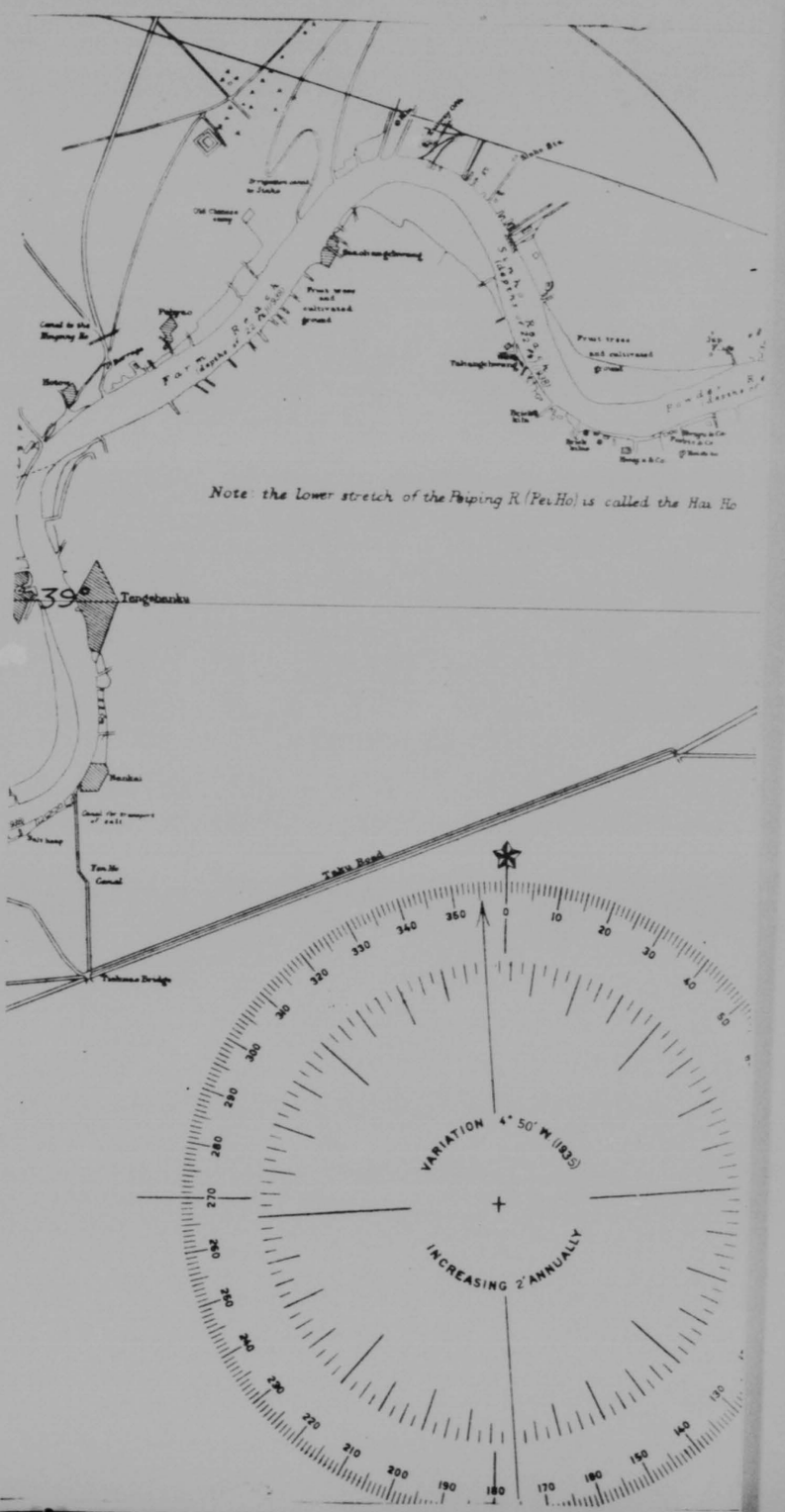
Vessels anchoring off Taku Bar lighter cargo to Tangku. These lighters are quite large and are built to withstand the heavy seas that occur off the Bar. Considerable lighterage and towing equipment is necessary to operate the port (Targets 2, 29).

Ice breakers and dredges are both important targets in this port.

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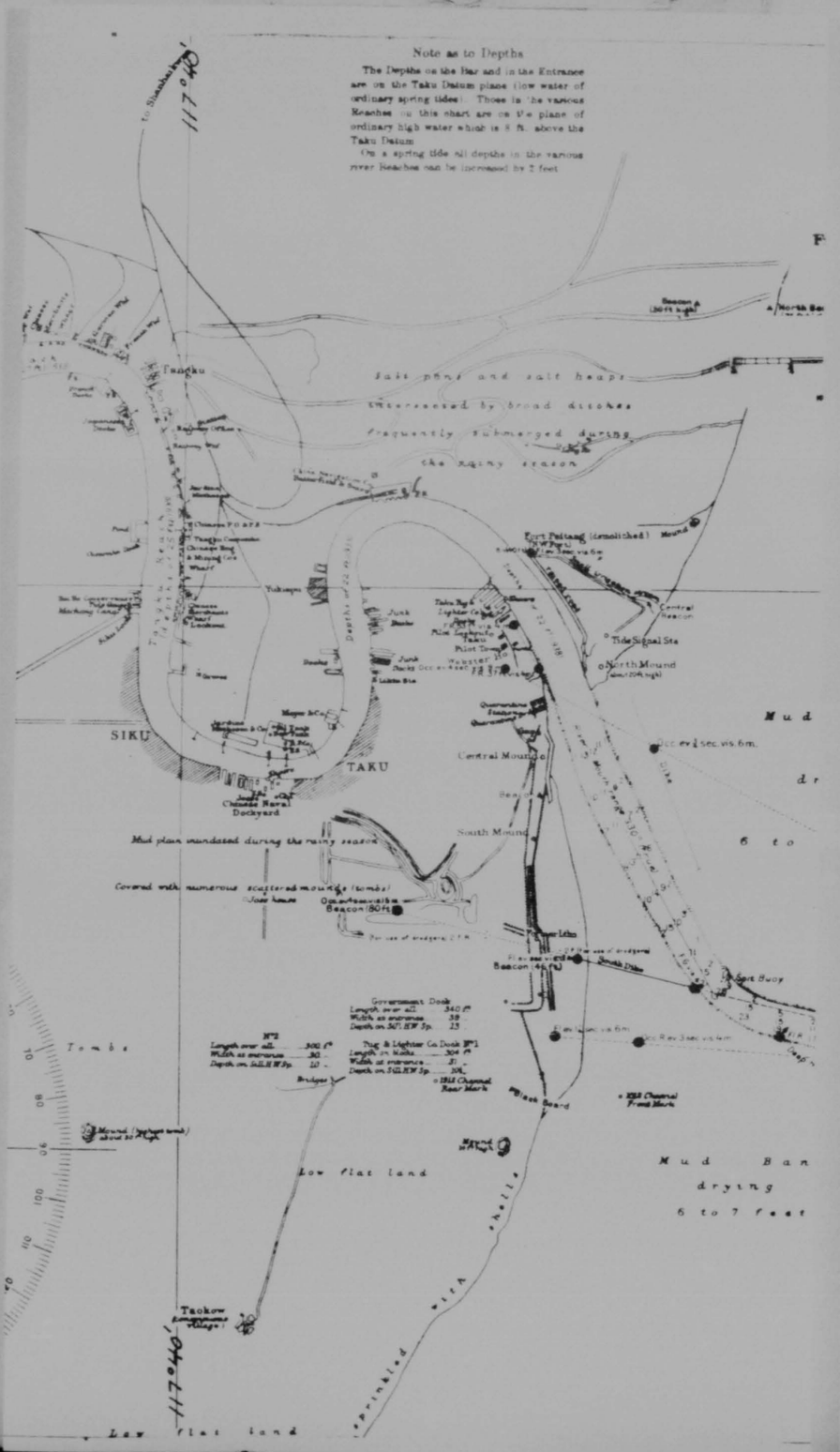
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TANGKU AND TAKU BAR

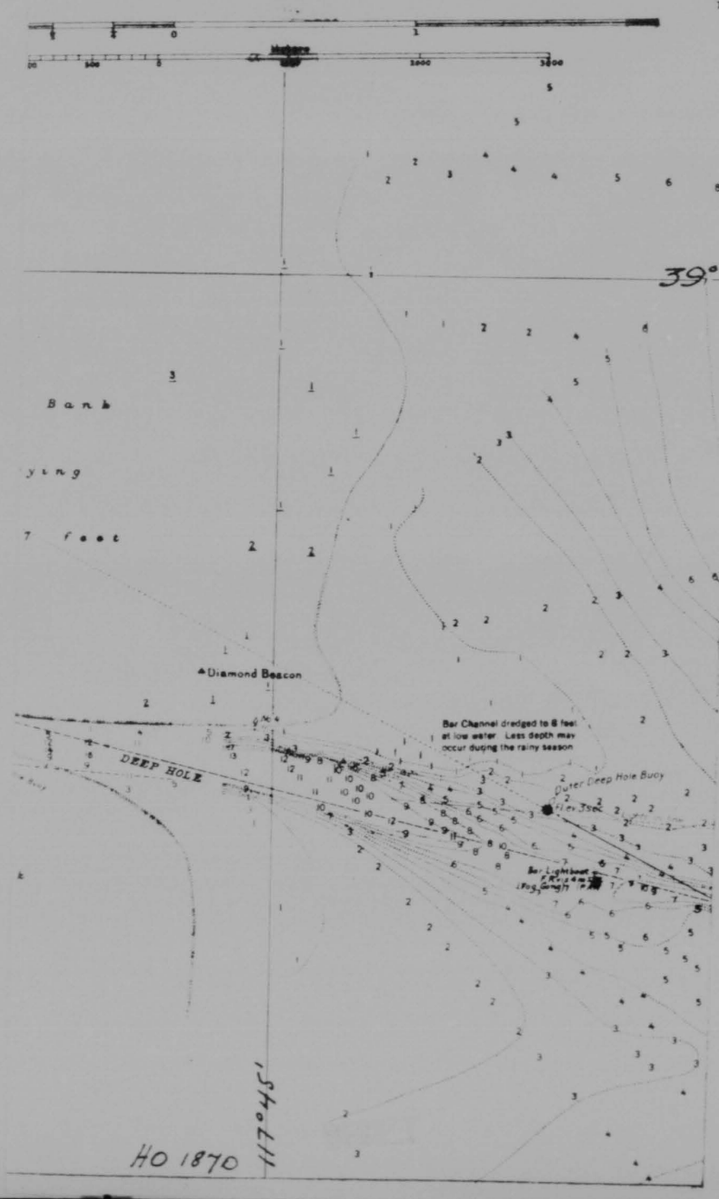
(PORT FOR TIENTSIN)

rom surveys by the Hai Ho Conservancy Commission between 1905 and 1930

(Depths on the Bar, inside the 12 ft. curve, are from the 1921 Report of the Commission; from Deep Hole to Quarantine Sta., they are from Chinese Admiralty chart of 1931)

[redacted] IN FEET

HEIGHTS IN FEET [redacted] H WATER OF SPRING TIDES



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SECRET

April 1943 | TSINGTAO (CHINA) | 36° 04' N 120° 19' E

Tsingtao has two "breakwater harbors." The Commercial Harbor (Target 73) is protected by a semicircular breakwater on the north. However, only the southern or outer half is dredged to a general depth of 26 feet; the general depth of the northern half is less than 6 feet. Ships will not be found north of a line from No. 4 pier to the northern end of Pier 5.

In Commercial Harbor (Target 73) are 5 piers; they are numbered from south to north, and measure approximately as follows:

Pier 1	2500 ft berthing space
Pier 2	3600 ft berthing space
Pier 3	3000 ft berthing space
Pier 4	550 ft berthing space
Pier 5	3300 ft berthing space

In all 14,000 linear feet are available for 12 berths in normal times. A greater number of ships could be accomodated with crowding. Pier 1 for the first half of 1942 was used by the Japanese Navy. Pier 2 is best suited for general cargo shipments; Pier 3 is used for coal and salt, and Pier 4 is the tanker pier with pipe lines leading to oil storage on both sides of the RR to the East. The tip of the breakwater, known as Pier 5, is used for salt and coal.

Piers 1 and 2 have freight sheds of brick construction; they are large structures, some of which are two-story. No structures of consequence are known to exist on Piers 3, 4, or 5. RR spurs serve all piers and cargo can be trans-shipped from ship to RR car. No mechanical loading equipment is known to be installed.

The "Boat Harbor" (Target 94) is a Japanese naval yard where surface raiders are reported to have been fitted out.

In "Junk Harbor" is a drydock capable of taking a medium sized destroyer (Target 93). This harbor is normally filled with junks, which are now used by the Japanese for short hauls and as feeders for steamships.

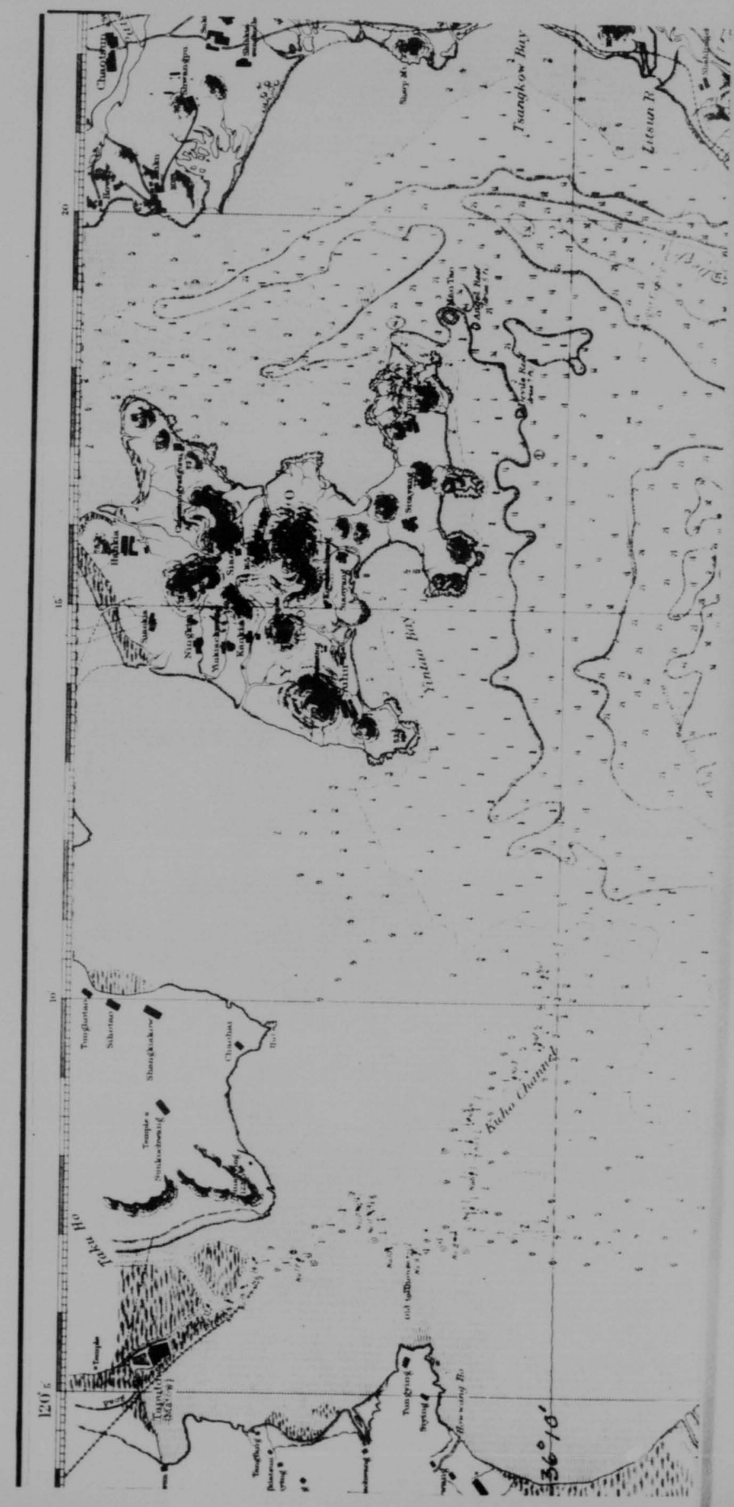
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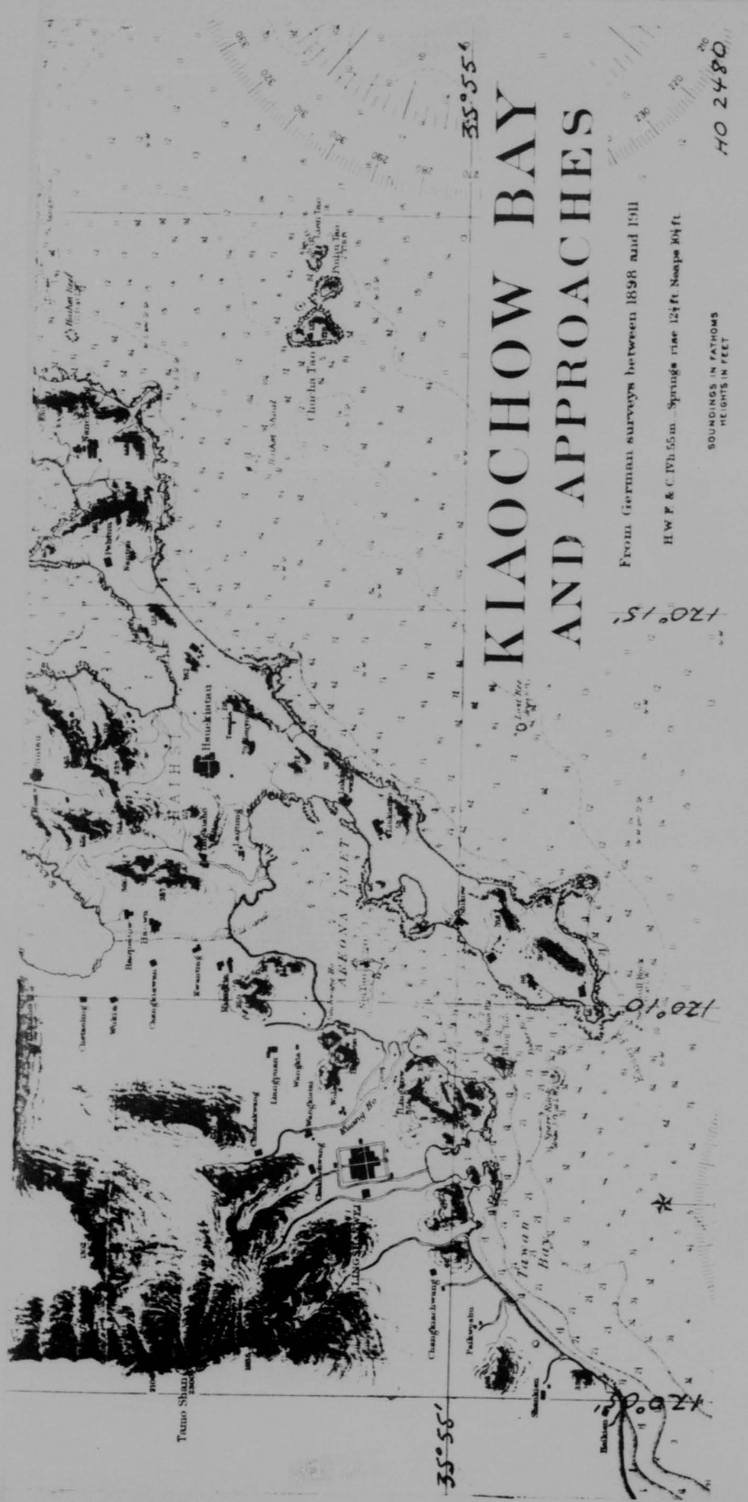
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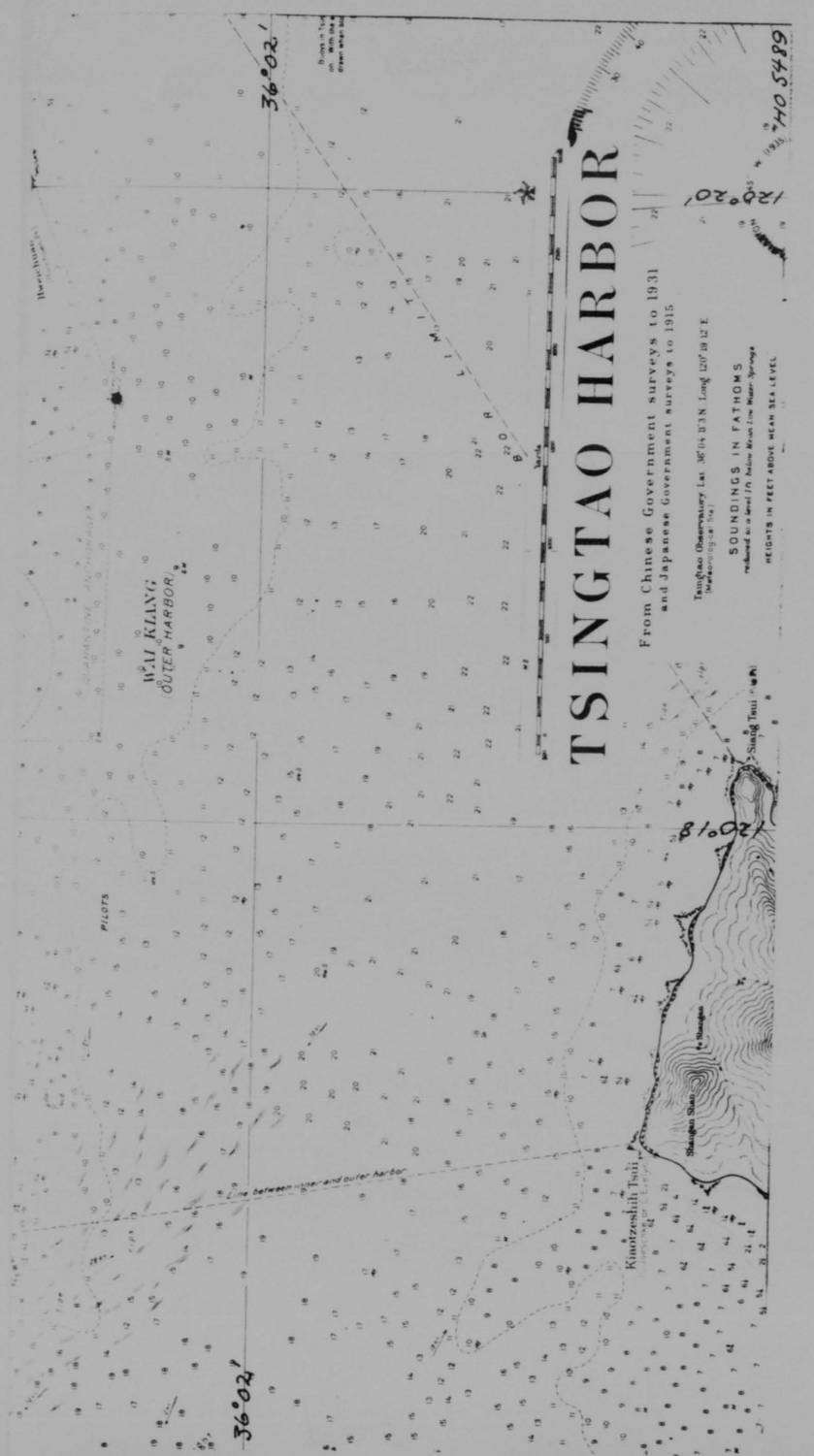


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April 1943

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YANGTZE RIVER
(Ore Shipping Ports)

The Tayeh Iron Mines, about 94 air miles SE of Hankow, are the source of an estimated 1,000,000 tons of ore for the Japanese. This ore tests about 60% iron content and is as good as any now available to the Japanese. This ore has been moving in increasing quantities to Japan since 1900.

There are two shipping points on the river:

Shen-chia-yuan, 1/2 mile down-river from Hwang-shi-kang. There is a wharf here for loading ocean-going vessels. A 13-mile standard gauge RR connected this wharf with the Hsiang-pi-shan mines previous to Japanese occupation.

Shi-hui-yao, 3 miles down-river from Hwang-shi-kang. Pontoon wharves have been used here for loading vessels. An 18-mile standard gauge RR ran from the loading pontoons to Tieh-shan and Te-tao-wan Mines before Japanese occupation.

In 1935, several train loads of ore were being loaded daily at Shi-hui-yao during high water season on freighters for Japan. During this year, sixty Japanese freighters called here and took an average of 4000 tons of ore each trip - a ship every two days during the high-water season of roughly 4 months.

During low-water season, vessels drawing more than 12 ft have not in the past ascended the river above Wuhu and ore has been lightered down by tugs for trans-shipment there. It is indicated that the Japanese are lightering in considerable quantity to Wuhu during low water.

If the Japanese attempt to move from Shi-hui-yao and Shen-chia-yuan accumulated ore during the high-water season of 1943, several vessels a day may be found at both of these ports.

The high water season for these ore shipping ports is from May to September. During this season, the descent of the river is hazardous due to swift current and difficult channels. Any ship interfered within one of these channels, if not hit during air attack, would be forced onto rocks and severely damaged if not completely wrecked.

In addition to ore movements, military supplies and troop movements will account for much shipping on the river above Nanking. Particularly important for this type of traffic is the "Yangtze river ship", a special type of high-powered, shallow-draft vessel designed for low water season, and for the passage of rapids on the upper river.

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YANGTZE RIVER
KIUKIANG to HANKOW



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April 1943 SECRET

SHANGHAI
(CHINA)

One of the chief reasons for the expectancy of shipping in Shanghai Harbor are the ship repair facilities of the port and its drydocks.

The wharves of the port are used for storage and are both extensive and highly vulnerable to air attack. The Shanghai wharves are constructed of creosoted piling and planking. The wharf itself extends from the bank into the river to allow for depth during low water periods - the resulting air chamber underneath, which often extends under the freight shed itself, make it difficult, if not impossible to control a fire once under way.

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TOSUM

April 1943

TOSUM (OTEA) 31° 23' N 121° 30' E

Tosum village, at the mouth of the Hwangpoo River, is reported to be a point of military storage and transhipment. A branch line of the Shanghai-Nanking RR terminates in Tosum 200 ft from the river bank. This is the only point either in Shanghai or its vicinity where direct ship to RR car transhipment can be effected. Such transhipment in the port of Shanghai itself would require trucking through the city streets.

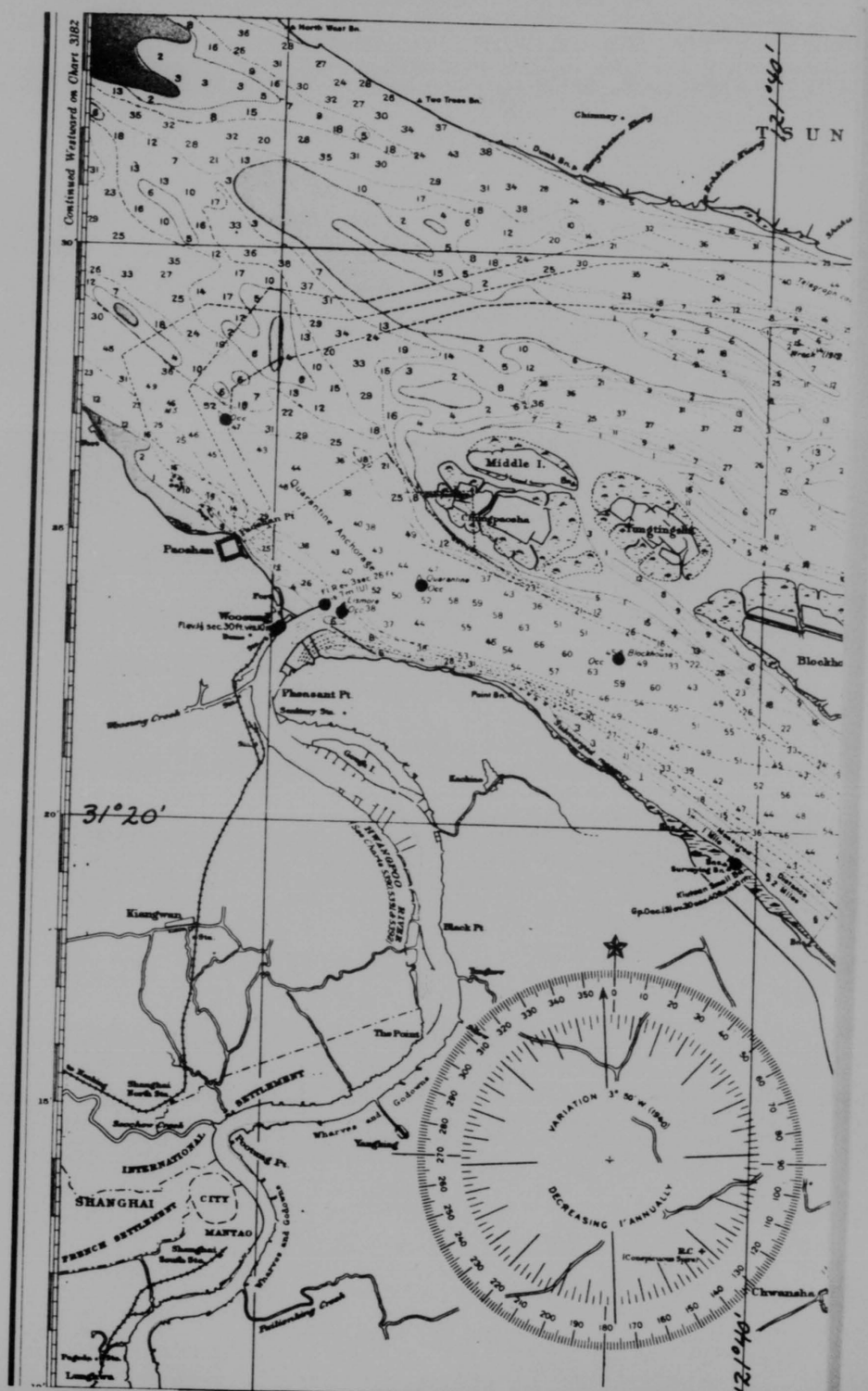
This new wharf area lies in the bight of the river bend where the current dredges its own channel. The depth alongside is sufficient without dredging. The wharf is of the creosoted piling and planking type, and highly inflammable.

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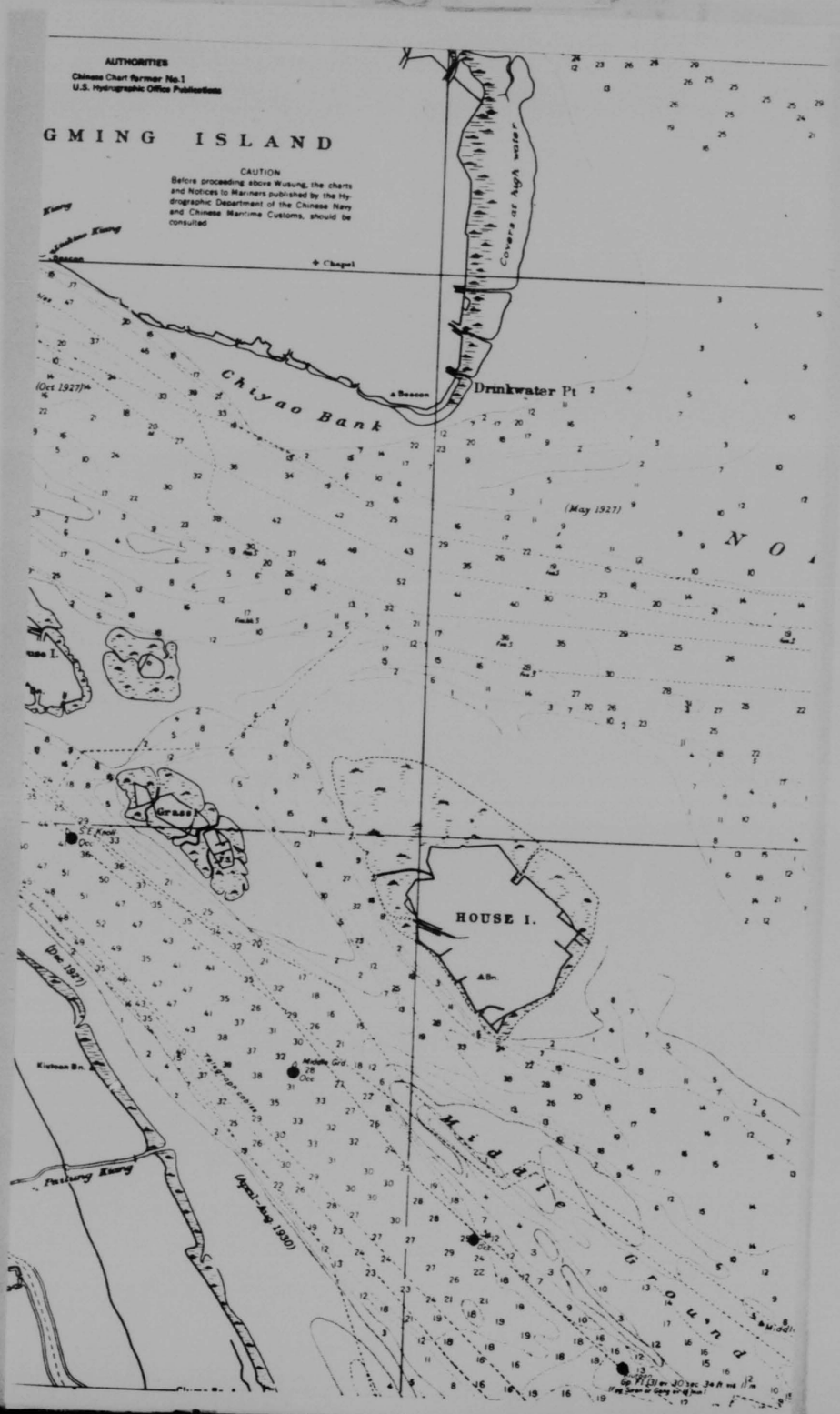
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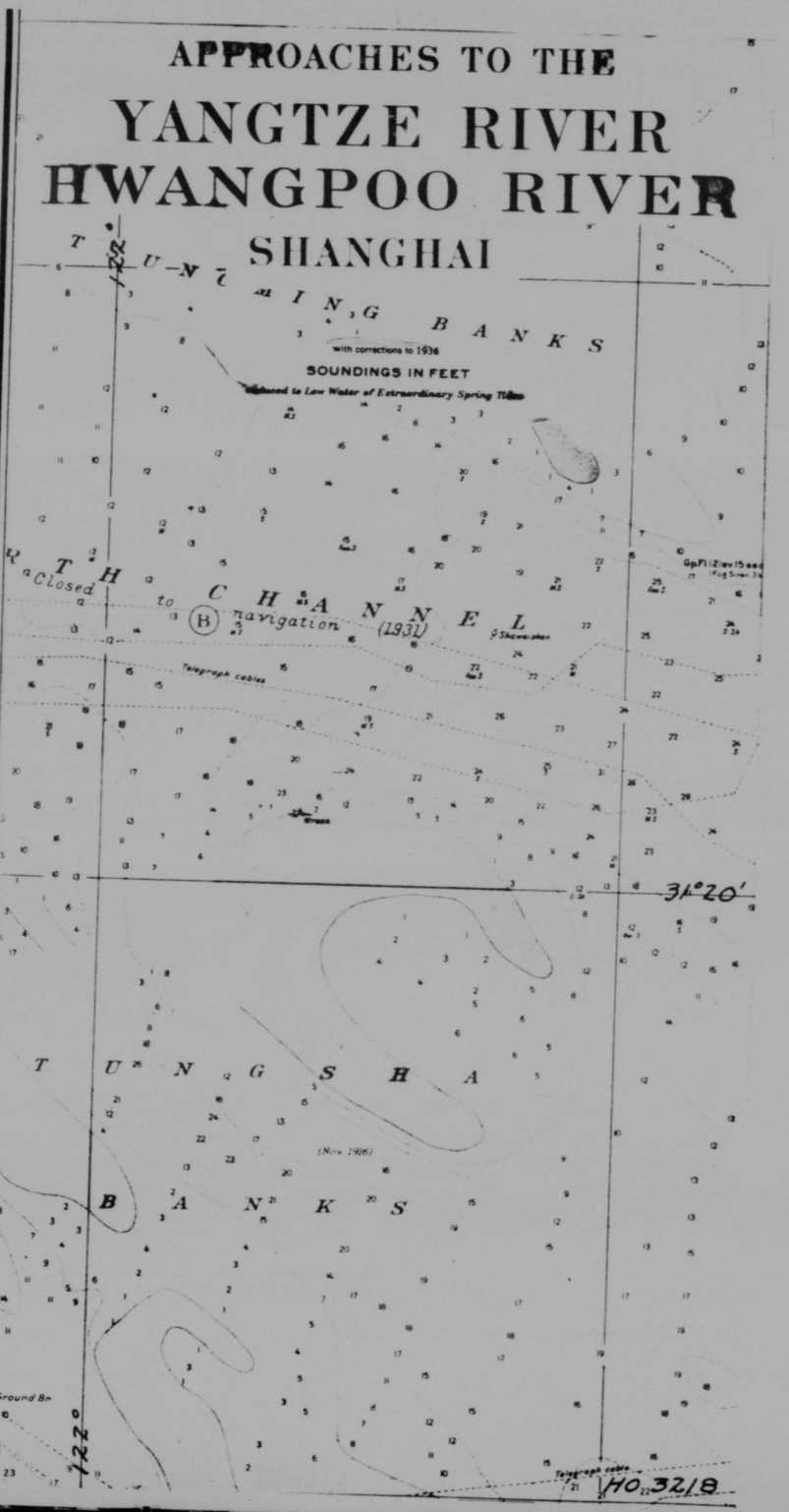
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April 1943

KARENKO (TAIWAN) 23° 58' N 121° 37' E

Karenko is a small, artificial "breakwater" port. Karenko Bay is very exposed, the open roadstead offering no protection against easterly winds. 2000-3000 foot mountains rise about 6 miles west of the port.

The harbor, formed by a sea wall and breakwater which parallel the shore, extends in a general N/S direction for a distance of approximately 1500 yards.

All berthing and loading facilities (Target 64) are located along the western side. Six wharves are available, 3 of which are believed capable of berthing 6000-ton ships, and the other 3 are known to berth 3000-ton ships. A few ships can moor at buoys in the southern part of the harbor. There are about 10 warehouses along the western side and a single track railroad spur connects this part of the harbor with the Karenko RR Station about 3 miles to the SW.

The principal commodities handled at Karenko are (1) bauxite (2) nickel ore and (3) phosphate rock.

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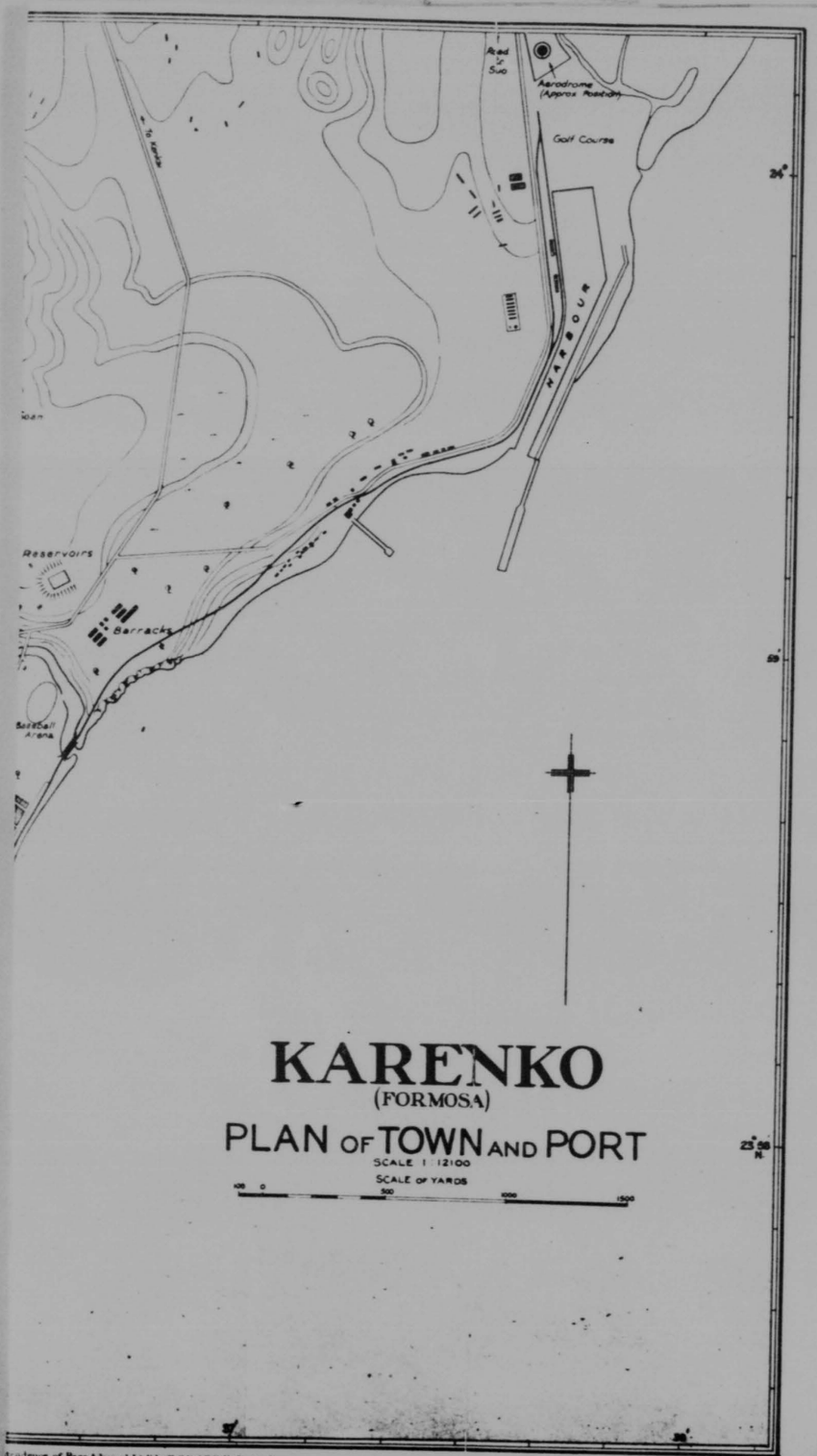


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49
July
1937



KARENKO
(FORMOSA)

PLAN OF TOWN AND PORT

SCALE 1 : 12100

SCALE OF YARDS

100 0 500 1000 1500

Admiralty Chart No. 2577

Published under the direction of Rear Admiral J.A. Edgell C.B. O.B.E. Hydrographer

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April 1943

[illegible]
(TAITA)

25° 03' N
121° 45' E

The inner harbor is well sheltered, but affords only limited anchorage space for vessels anchoring in a general E/W line. The outer harbor is larger, but is open to the north.

All berthing facilities are located along the NW side of the inner harbor. Space is available for berthing a maximum of 25 ships of 2,000 tons. The Northwest Wharf (Target 15a) is approximately 1,000 yards long, of the "trade land" type, concrete surfaced. There are approximately 5 concrete storehouses, most of three stories. Railroad spurs run the entire length of the wharf and heavy-duty loading machinery is available to handle all cargo. This wharf is used almost exclusively for rail-car transhipment and storage.

Just SW of this wharf at the west end of a small inlet, is the Kiuchio Ko Dockyard (Target 15b) where 1 drydock and 1 patent slip are available for repairs. This inlet is also the site of large coal and fuel oil stores, and all lumbering is done here.

To the south of this inlet is the Southwest Keelung Wharf (Target 15c), the site of the Keelung Railroad Station and about 5 concrete storehouses. This wharf is approximately 700 yards long, of the "trade land" type, concrete surfaced. This wharf is used for transhipment of rice, sugar and other commodities.

400-foot hills enclose this harbor on the west, south and east.

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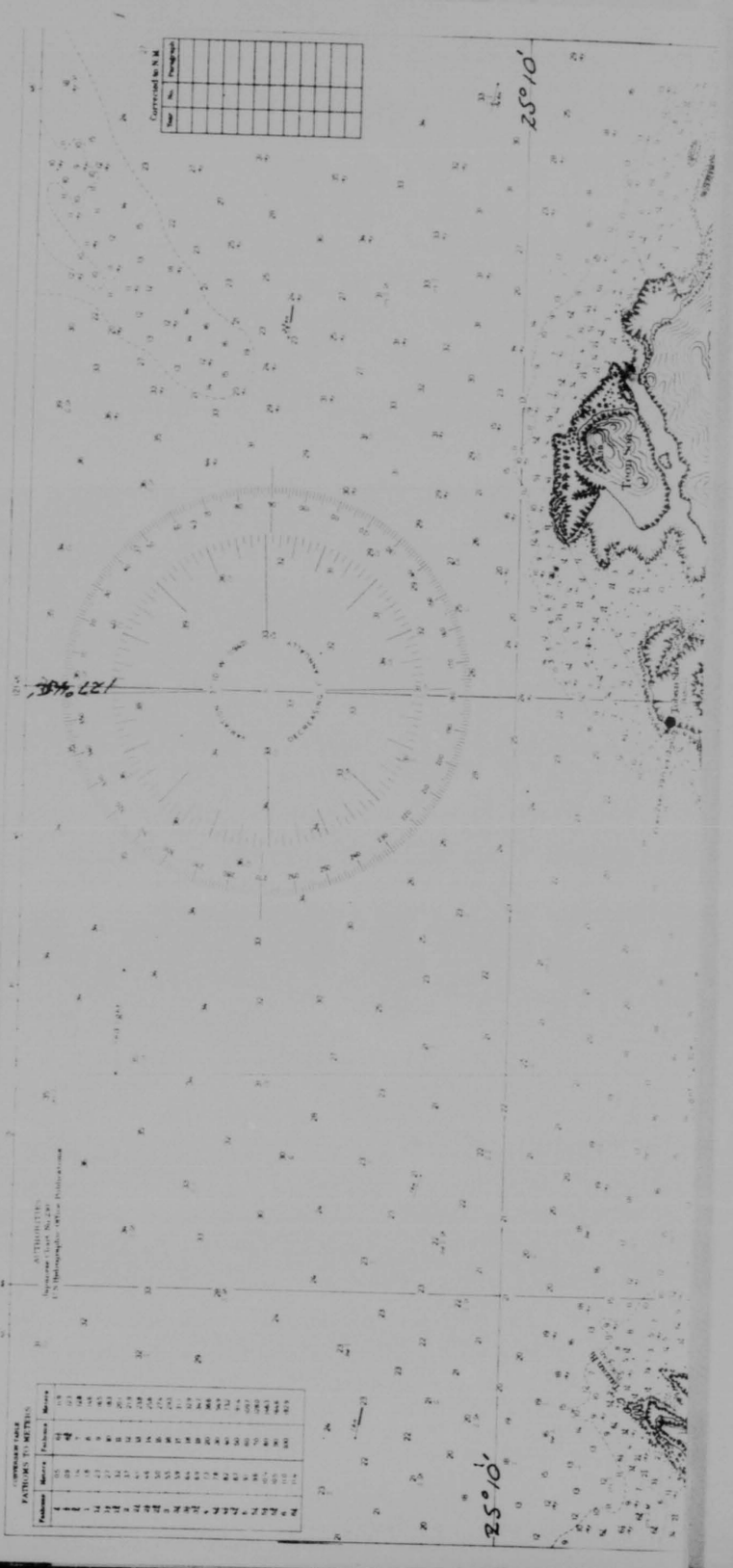
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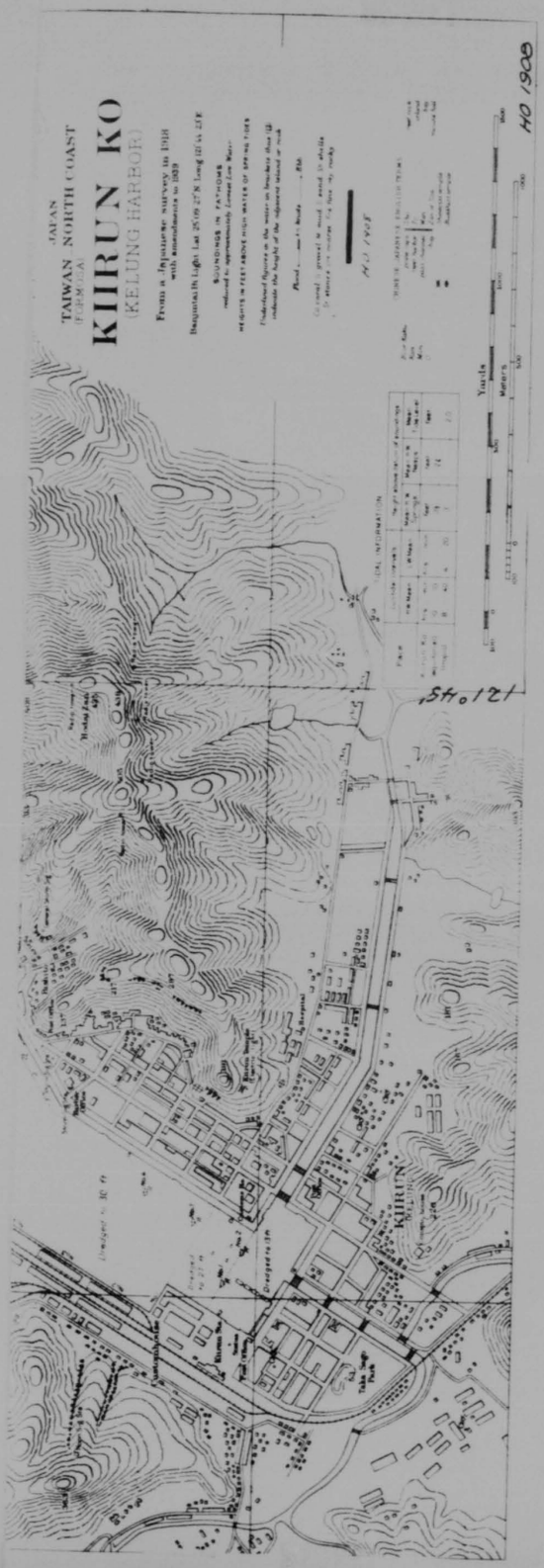
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April 1943 SECRET

24° 14' N
120° 30' E

NIITAKA (GOSEI)
(TAIWAN)

This "breakwater" port has been developed recently to handle some of the non-military shipping which formerly used the port of Keelung. The port is located at the mouth of a small river and will accommodate only vessels of about 2000-3000 tons.

At least one wharf (Target 100) with six storehouses is available. A RR spur from this wharf connects with the Takao-Keelung trunk RR line.

The port is still being expanded, and it is possible that additional facilities may now be available.

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April 1943 SECRET 22° 37' N
120° 15' E

TAKAO
(TAI'WAN)

Takao is a "breakwater" port, the entrance to which is very narrow and could be blocked by the sinking of one or two large ships there. The port is at the mouth of a long, shallow lagoon, but ships must anchor just south of the main wharf, in a general east/west line.

The Military Storehouse Wharf (Target 8a) is about 1500 yards long, concrete surfaced, and can berth about 4 ships of 3,000-5,000 tons. Railroad spurs from the freight yard (which lies just to the west) run the entire length of the wharf, and heavy-duty loading machinery is available to handle all cargo. There are 15-25 storehouses, about 8 of which are large, and of steel frame, galvanized iron construction. A cold storage plant (used for military supplies) lies at the east end of the wharf.

A smaller wharf (Target 8b) is located just east across a small river mouth from the main wharf. This wharf is also concrete surfaced, and it is the site of several storehouses. Oil bunkering facilities are available at the south end of this wharf.

The Kigo Naval Dockyard (Target 7) is located at the south side of the port. Facilities are available to repair medium sized vessels and some small ships are constructed here.

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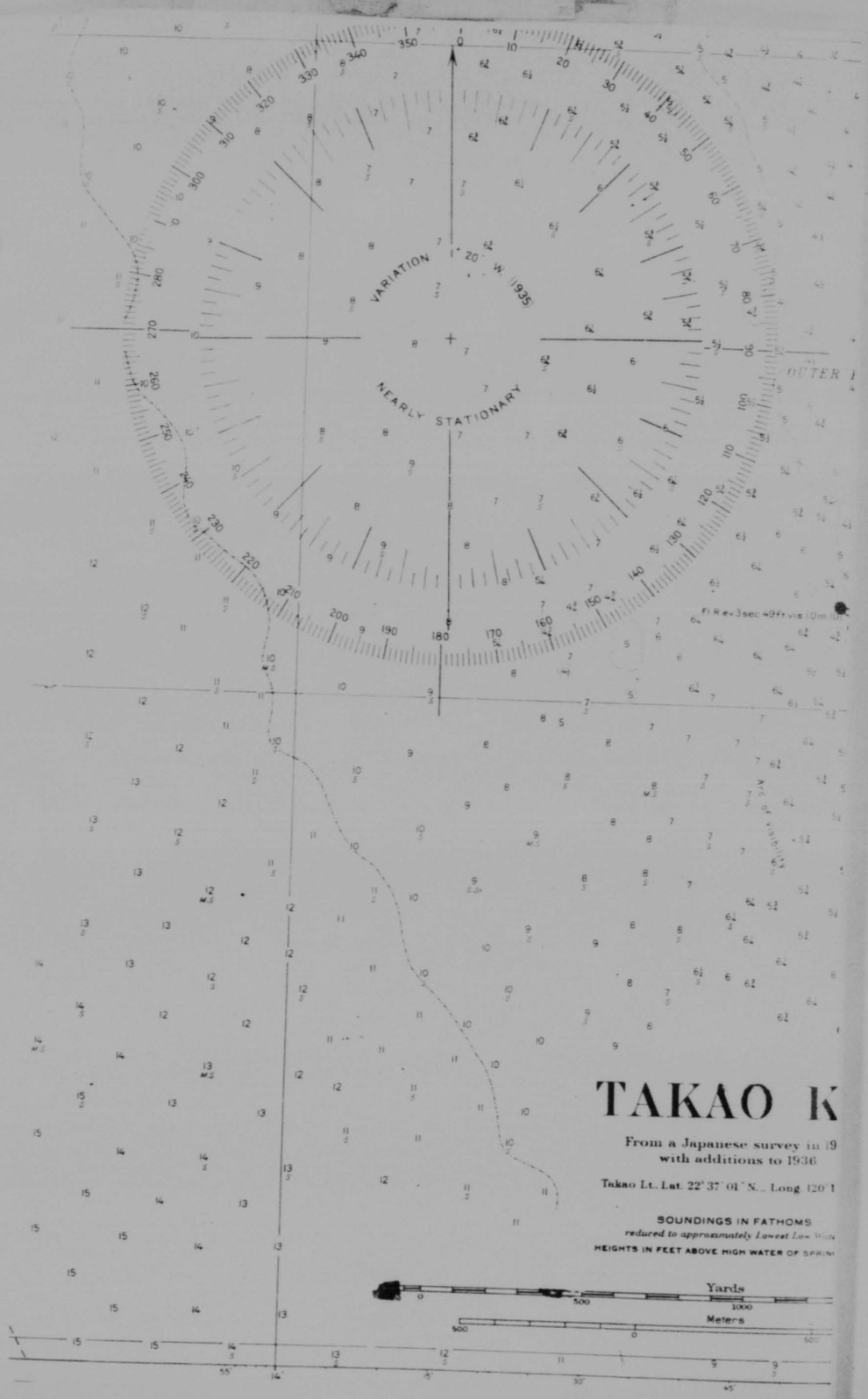
Profile of Ta'kao, Formosa harbor entrance

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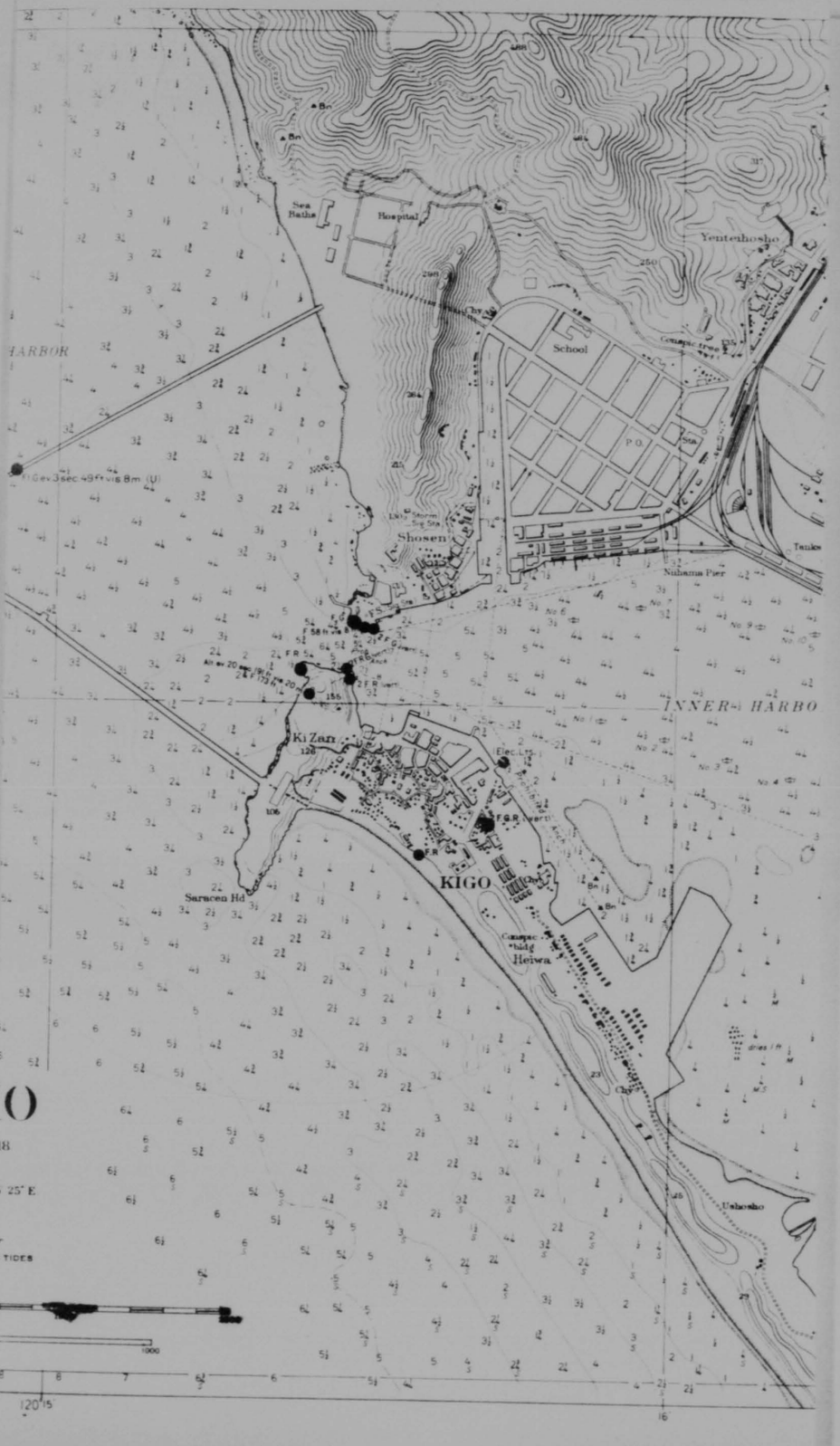
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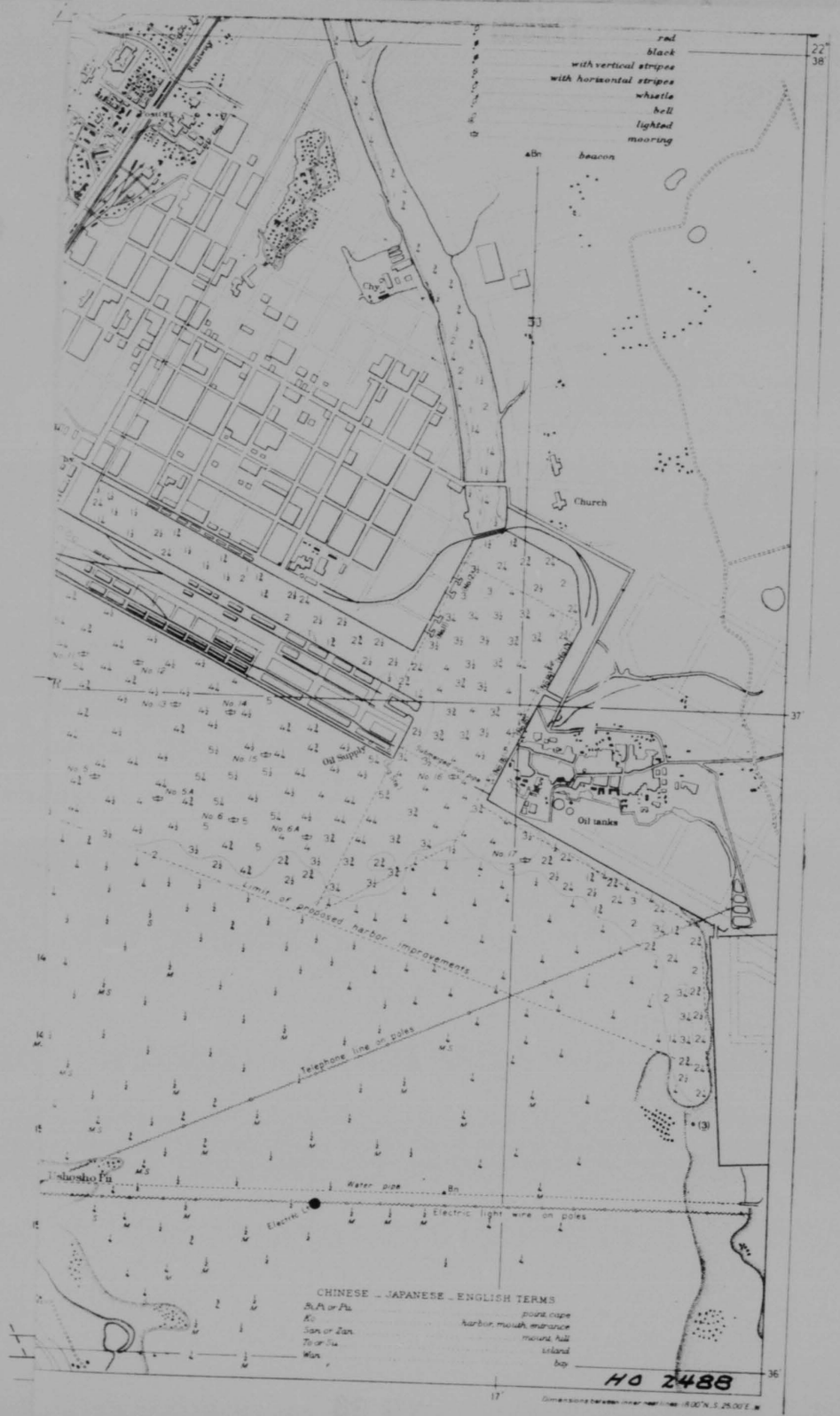


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April 1943

CAMPHA (FRENCH INDO-CHINA) 21° 02' N 107° 22' E

Port Campha is a coal shipping point. The wharf is 985 ft long with a depth alongside of 26 ft. It is equipped with four overhead travelling cranes. Each of these cranes can load coal at the rate of 120 tons per hour.

Vessels drawing 16½ ft can enter the port.

Lapic Pass leads from Henriette Pass from the west. It connects with Stone and Bourayne Channels from which Campha Channel branches off to the north.

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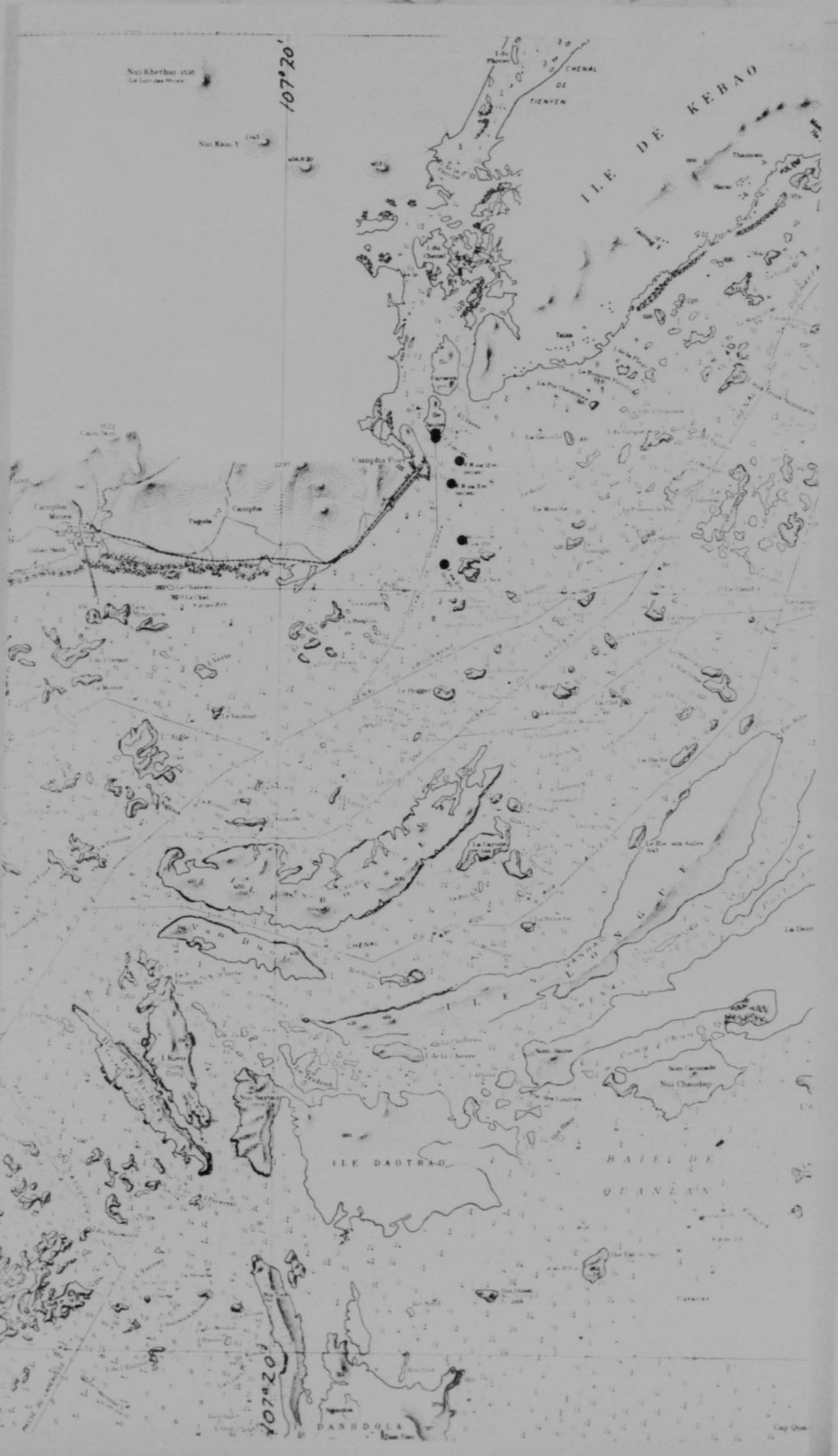
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April 1943 SECRET

HAIPHONG 20° 52' N
(FRENCH INDO-CHINA) 106° 41' E

Haiphong is located on the south bank of the Kua Kam below its junction with the Song Tam Bak. The main wharf has a depth alongside of 26 ft and berthing room for six large and several smaller vessels. Lighters have been available for vessels anchored in the river.

The Kua Kam has silted up and vessels following the Kua Kam Trieu (Channel to Haiphong) enter the mouth of the Song Bachdang and use the maritime Canal across Dinhvu Island into the Kua Kam. This cut is nearly one mile long and 151 ft wide. The least depth is 25½ feet. Vessels can pass through this canal by night as well as day.

Vessels can reach Haiphong drawing 26 ft at high water springs, and those drawing 21 ft at all times.

Haiphong is on the railroad to the interior and to the south.

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April 1943 SECRET

HONGAI 20° 57' N
(FRENCH INDO-CHINA) 107° 04' E

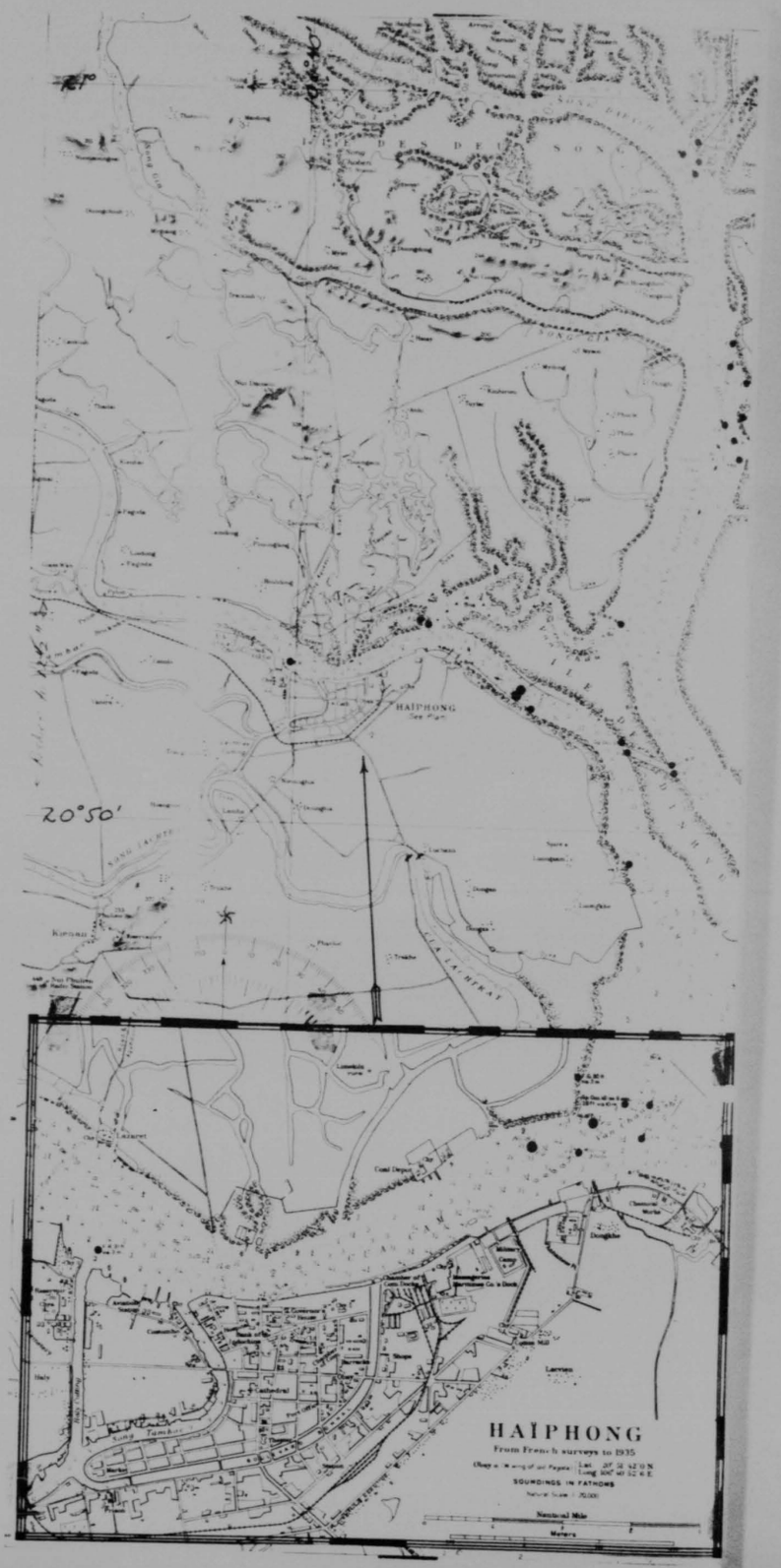
Hongai is a coal shipping port. There is one reinforced concrete wharf and two quays. The wharf is 202 ft long and has a depth of 23 ft alongside. Quay #1 is 230 ft long with a depth of 20 ft alongside; quay #2 is 202 ft long with a depth of 24½ ft alongside. The wharf and quays were equipped with seven power cranes of 6 to 7 tons when the Japanese seized the port. There was also a 60 ton floating crane. Hongai is connected with the coal mines by railroad.

Ships approaching Hongai use the two channels known as Henriette Pass and Hamelin Channel.

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April 1943 SECRET

SAIGON 10° 47' N
106° 42' E
(INDO-CHINA)

Saigon owes its importance as a port to the rice production of the region and its position as the port for the AR into Thailand.

In peacetime, rice season has been responsible for a concentration of shipping in the river; however, since the outbreak of the war, rice has accumulated in Saigon and these stockpiles do not appear to have been reduced by large "rice movements". Rice shipments seem to have been made when shipping was available as a result of military operations.

It has been reported that temporary storage warehouses have been erected to store these unusually large quantities of rice.

With increasing military importance of the AR into Thailand, more military shipping can be expected in Saigon. It is presumed that these ships, unless used for more critical raw materials from other regions, will load rice for the return voyage to Japan.

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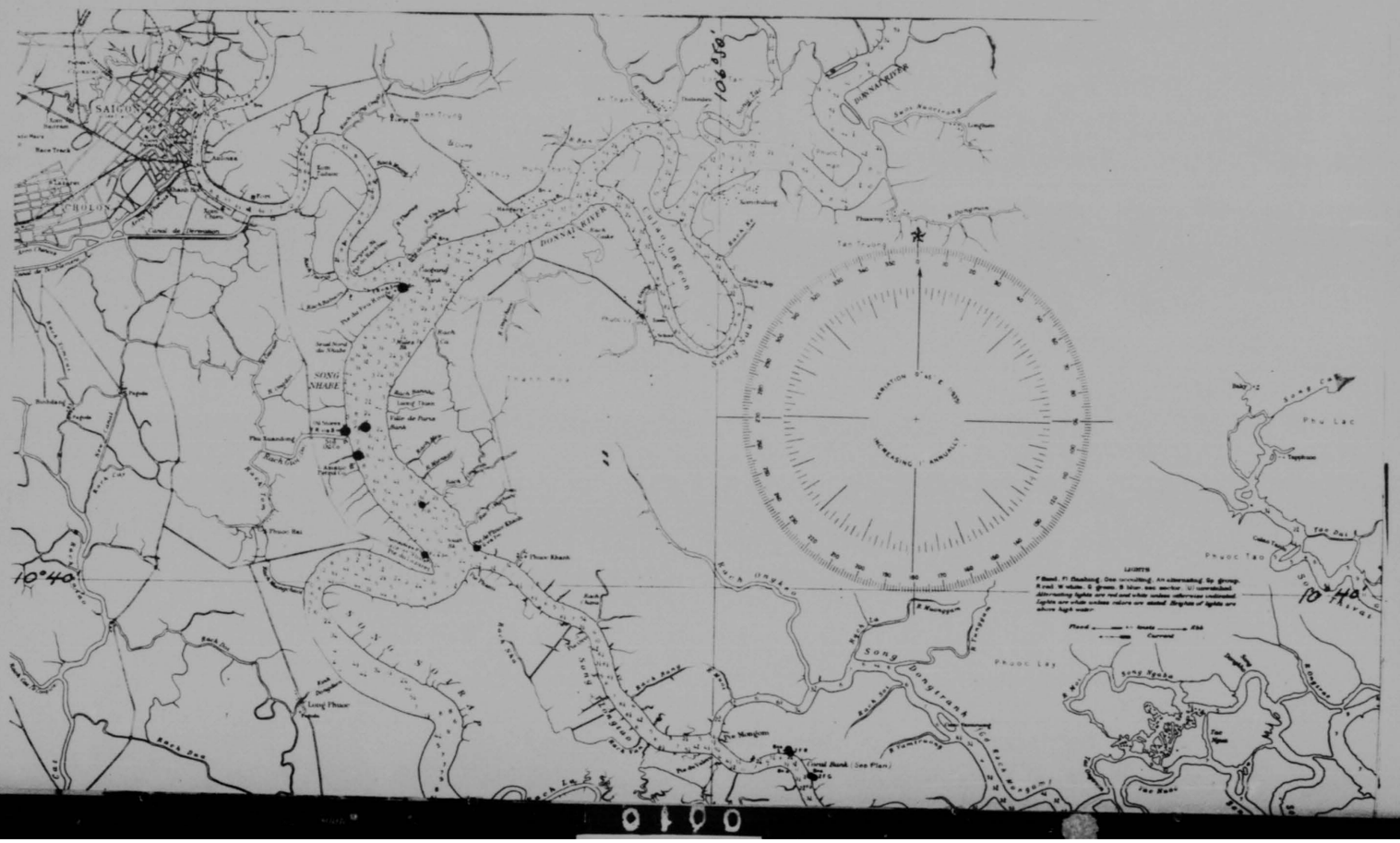
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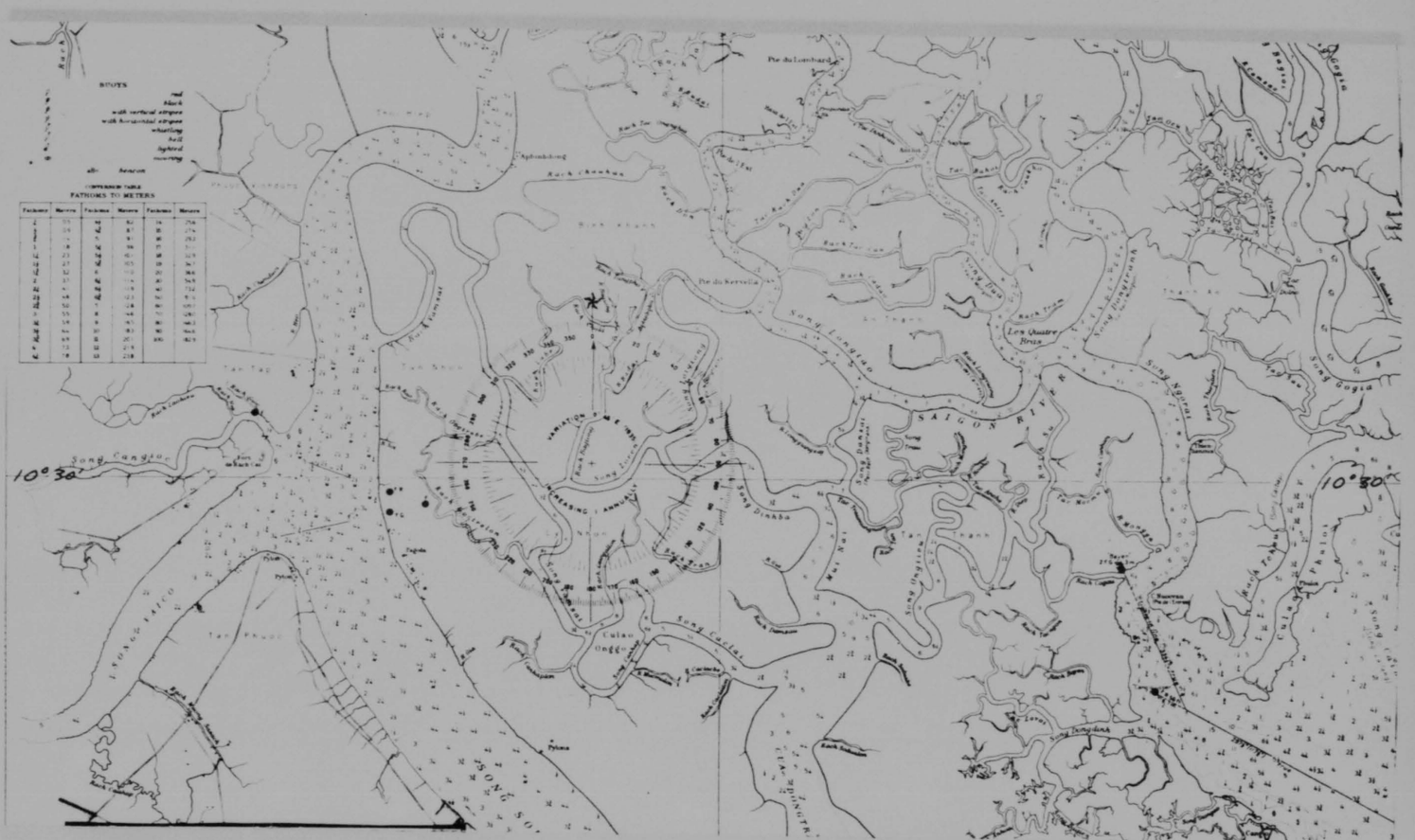
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SAIGON RIVER
Song Longtau
Song Dinhbe
Song Cangiuoc
Song Dogia
Song Nguoi
Song Ongdoc
Song Thanhdoa
Song Cuulon
Song Soirap
Song Thiatinh
Rach Chanhuu
Rach Tomuoi
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April 1943 SECRET

DAIREN (DAIRENRYO) 38° 56' N 121° 39' E

The inner harbor (Target 13) at Dairen is a "breakwater port" approximately 1½ mi long by 3/4 mi wide. It encloses 4 piers measuring approximately as follows:

Piers 1 & 4	1950 by 600 ft
Piers 2 & 3	1950 by 575 ft

These piers afford approximately 14,450 linear feet for berthing purposes or space for 42 ships in normal times. Berthing space may be increased by crowding.

Piers are of "made land" type, concrete surfaced. Freight sheds on the piers are modern, of ferro-concrete or brick construction and measure at least 84,000 sq ft.

RR spurs serve the freight sheds and permit ship to RR car transhipment. Some mechanical loading equipment is in use. In addition to pier facilities a number of lighters are available. Tugs are adequate for handling ships and lighter towing.

The bay affords anchorage sheltered from all winds except those from SE to WNW but the bottom is soft mud and bad holding ground for anchors. Ships will be found anchored northward of N breakwater.

The East entrance to the breakwater is not really used; only light draft vessels would attempt to make open water thru the west entrance. There are good approaches to the inner harbor and vessels could make the open sea thru any passages to the east. It would take time however to clear the inner harbor of shipping in the event of air attack.

In winter, the outer part of Dairen Ko is free from ice; in winter the bay freezes slightly, but not sufficiently to prevent vessels from entering or leaving. Ice forms in the inner harbor but berthing of vessels is assisted by ice breakers. Booms are laid across breakwater entrances to prevent ice from drifting inside the inner harbor.

Foggy weather is common in spring and early summer. Heavy squalls are frequent in N to SW winds.

Across Dairen Ko NNW of the inner harbor is the coal loading pier at Kanseishi. This pier is 1050 ft long by 150 ft wide. Normally it can berth four ships and is protected by a breakwater to the east and to the west.

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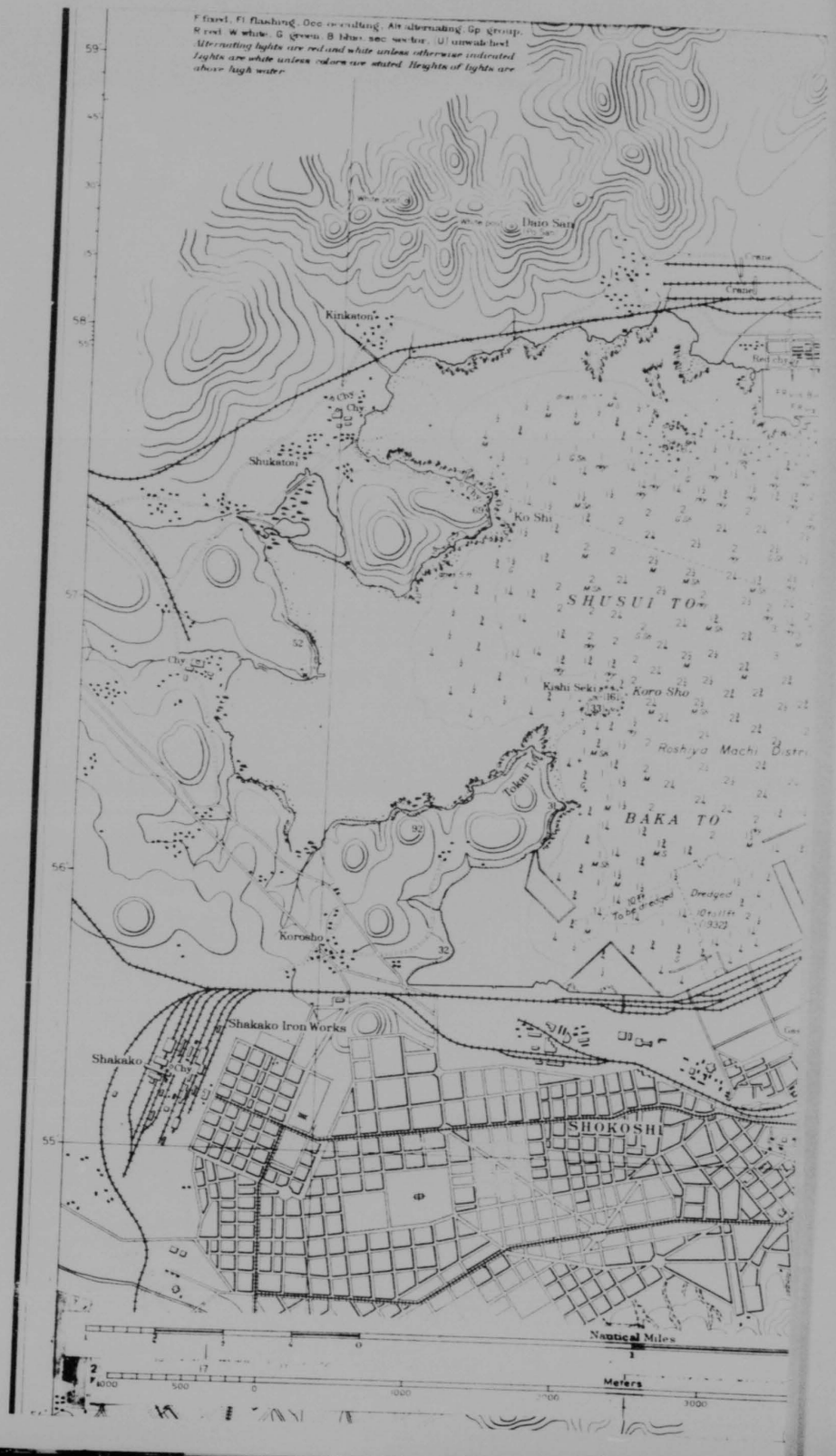
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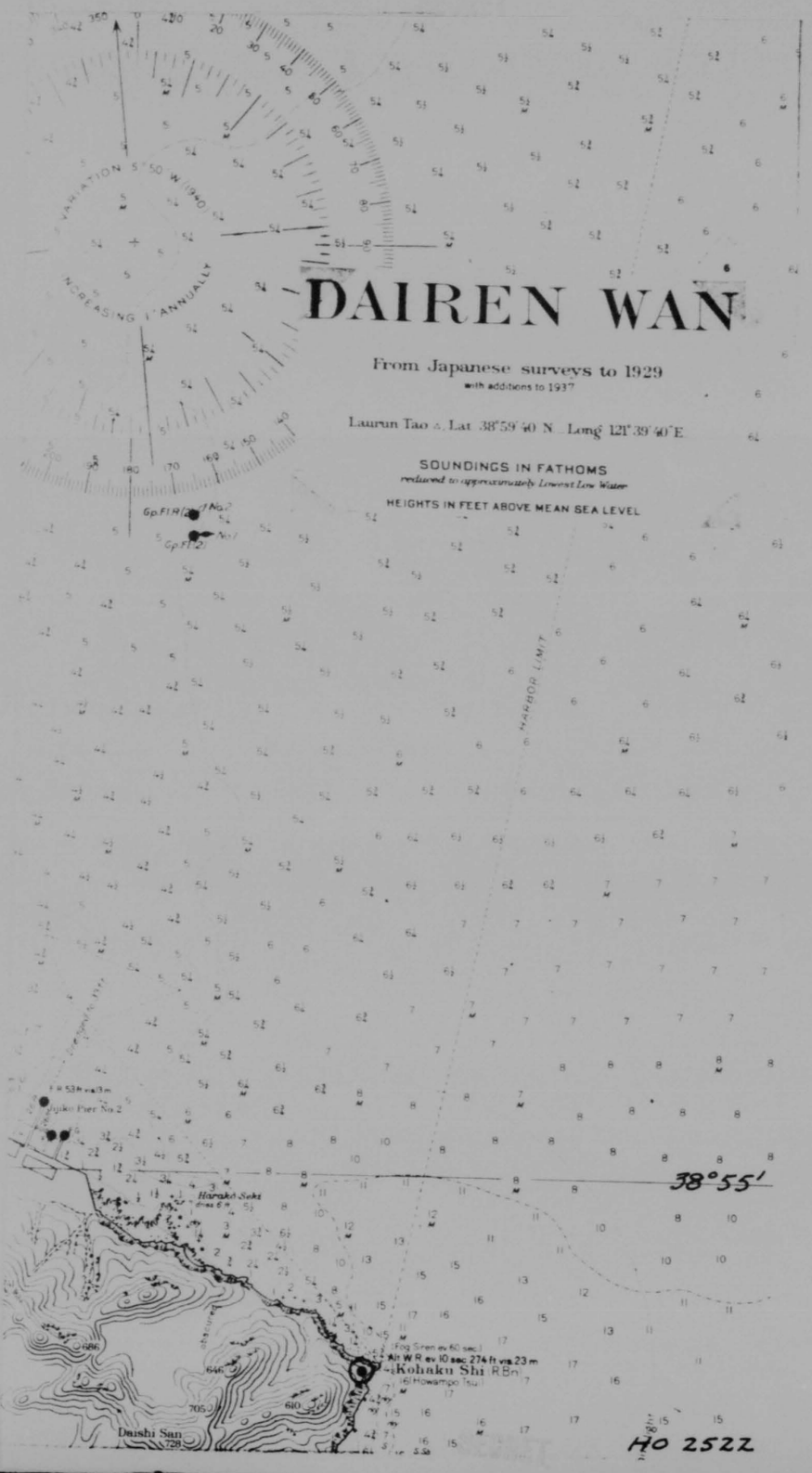


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April 1943

MANILA
(PHILIPPINES)

14° 35' N
120° 58' E

The port of Manila lies on the East shore of Manila Bay NE by E of Corregidor at the mouth of the bay, 30 miles distant.

A breakwater encloses four piers of the following dimensions:

Pier 7	1300 x 240 ft
" 5	730 x 160 ft
" 3	680 x 120 ft
" 1	550 x 60 ft

These piers are of concrete construction and are covered by single structures from end to end. On pier 7 the structure is concrete, on the other piers steel. All loading equipment is reported to have been destroyed before Japanese seizure. All piers were piped for fuel oil and water.

Pier 1, used by U. S. Army, is reported to have been badly damaged. The Army Quartermaster Depot, to the north of Pier 1 and east of Inner Basin, is reported to have been burned.

On the north bank of the Pasig River between the mouth of the river and the first bridge is the chief commercial warehouse area of the port. The quays along this area (about 3/4 of a mile long), previous to occupation, were used by inter-island shipping.

To the north of the river mouth is the new Farola Pier area, which was not completed before the war. It is reported the Japanese have moved the floating drydock Dewey, claimed to have been raised by them to this area.

The Earnshaw Dockyard on the Inner Basin was completely destroyed and it is reported that no effort has been made to rebuild it. However, any above water repairs can be made either at the Atlantic Gulf and Pacific Machine Shops on the north bank of the Pasig opposite the Inner Basin or at Cavite, reported rebuilt after destruction.

There is unlimited anchorage in the port area with adequate depth for any type of shipping.

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April 1943 SECRET

MASINLOC 15° 33' N
(PHILIPPINES) 119° 56' E

Chrome ore shipping point. There is one pier about 1 mile north of the mouth of the Masinloc River. There is sufficient water in the approaches to the pier for any type of shipping.

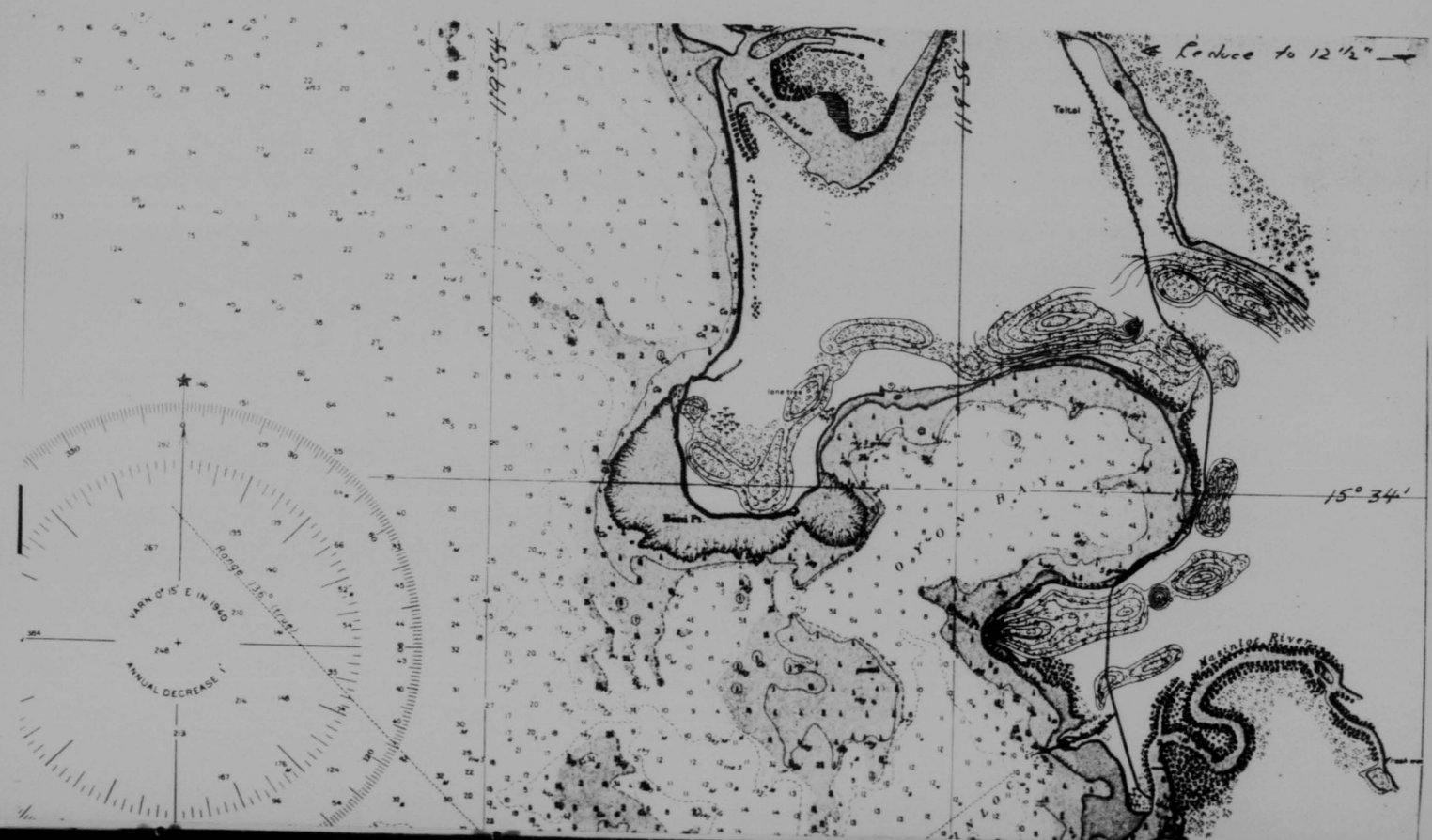
Information as to production and shipment for the year 1943 is lacking. There is evidence that at the outbreak of the war, there existed large stockpiles of chrome in Japan. It is not believed that chrome ore will be shipped from Masinloc at the expense of more-critical raw materials from other regions.

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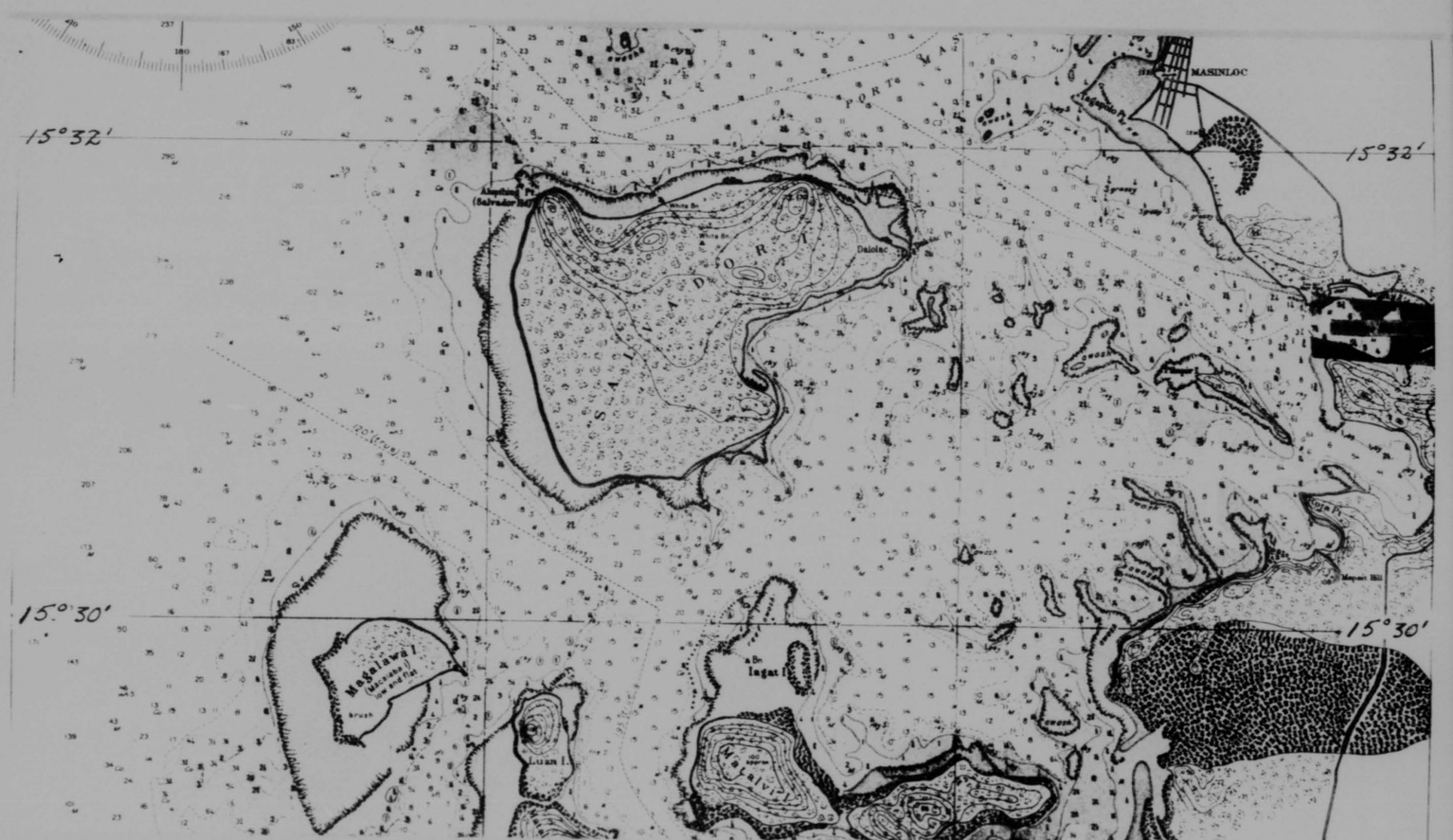


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PAMBUJAN SUR (PHILIP INES) 11° 15' N 125° 49' E

This port on the SL coast of Samar is an iron ore shipping point.

There is one pier with a 24-inch belt conveyor loader which accommodates ore vessel lying broadside to the end of the pier. The vessel is shifted to load from hatch to hatch. Loading capacity is 2500 tons per day.

This ore tests better than 60% iron content. No details are available as to current production or shipments, however, it is believed the Japanese are taking from this port whatever quantities shipping conditions permit.

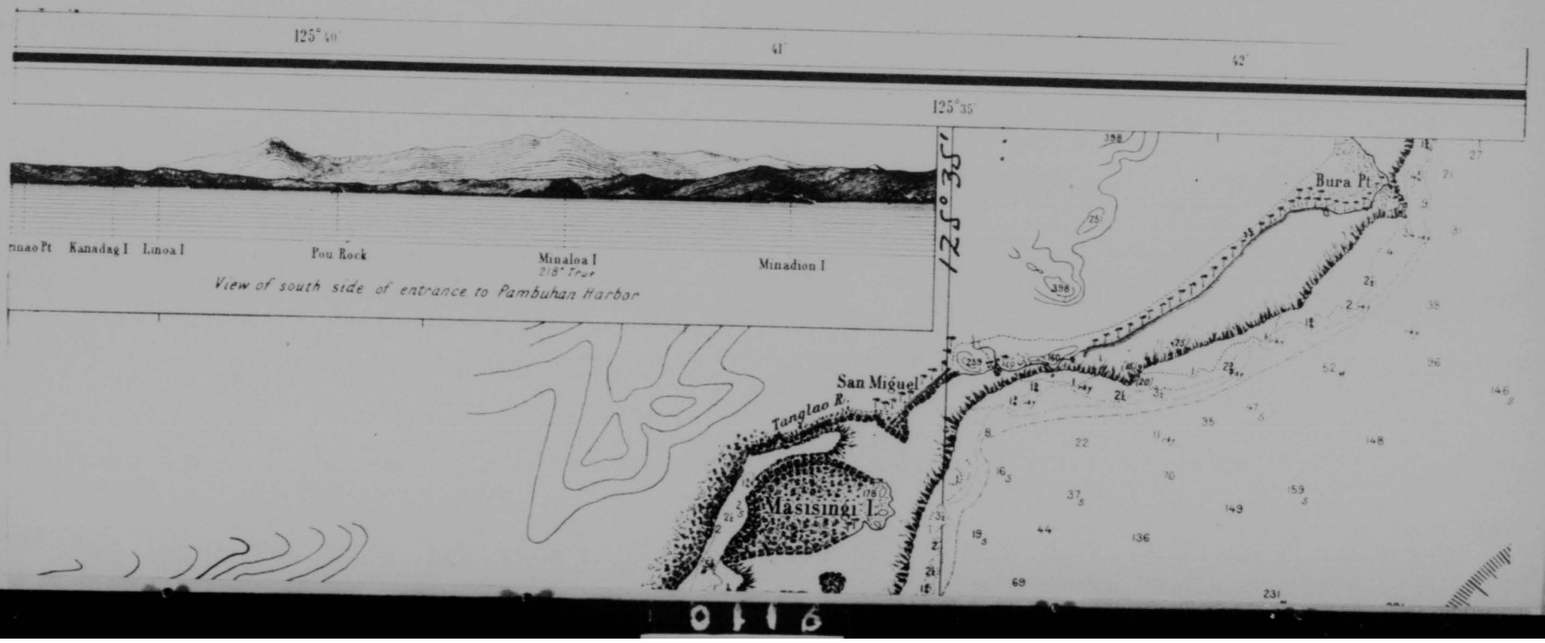
The ore is mined in the interior and brought to shipside by railroad with diesel-powered locomotives.

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April 1943 SECRET

PARACALE 14° 19' N
(CALAMBAYANGA IS) 122° 39' E

(PHILIPPINES)

This is an ore shipping port. There is one pier on the NE coast of Calambayanga Island. This pier permits the loading of two 10,000 ton vessels at the same time.

The Island is connected with Larap Peninsula by a 24 gauge RR trestle about 1/3 mile in length.

This ore tests about 60% iron content. To secure this ore was one of the objectives of the Japanese in the Philippines.

The mines are open cut and very little permanent damage could be done by air attack. The pier, and trestle are the only targets related to the loading vessels.

To maintain steel production adequate for the support of a large scale war, this port must contribute ore until greatly increased mine production has been achieved on the North Asiatic Mainland. With shipping available, it is presumed that the Japanese are shipping in quantity and that lightering is being resorted to when pier loading is inadequate.

It is understood that the limiting factor on ore shipments from this port is not mine production or land transportation, but ships for transport to Japanese mills.

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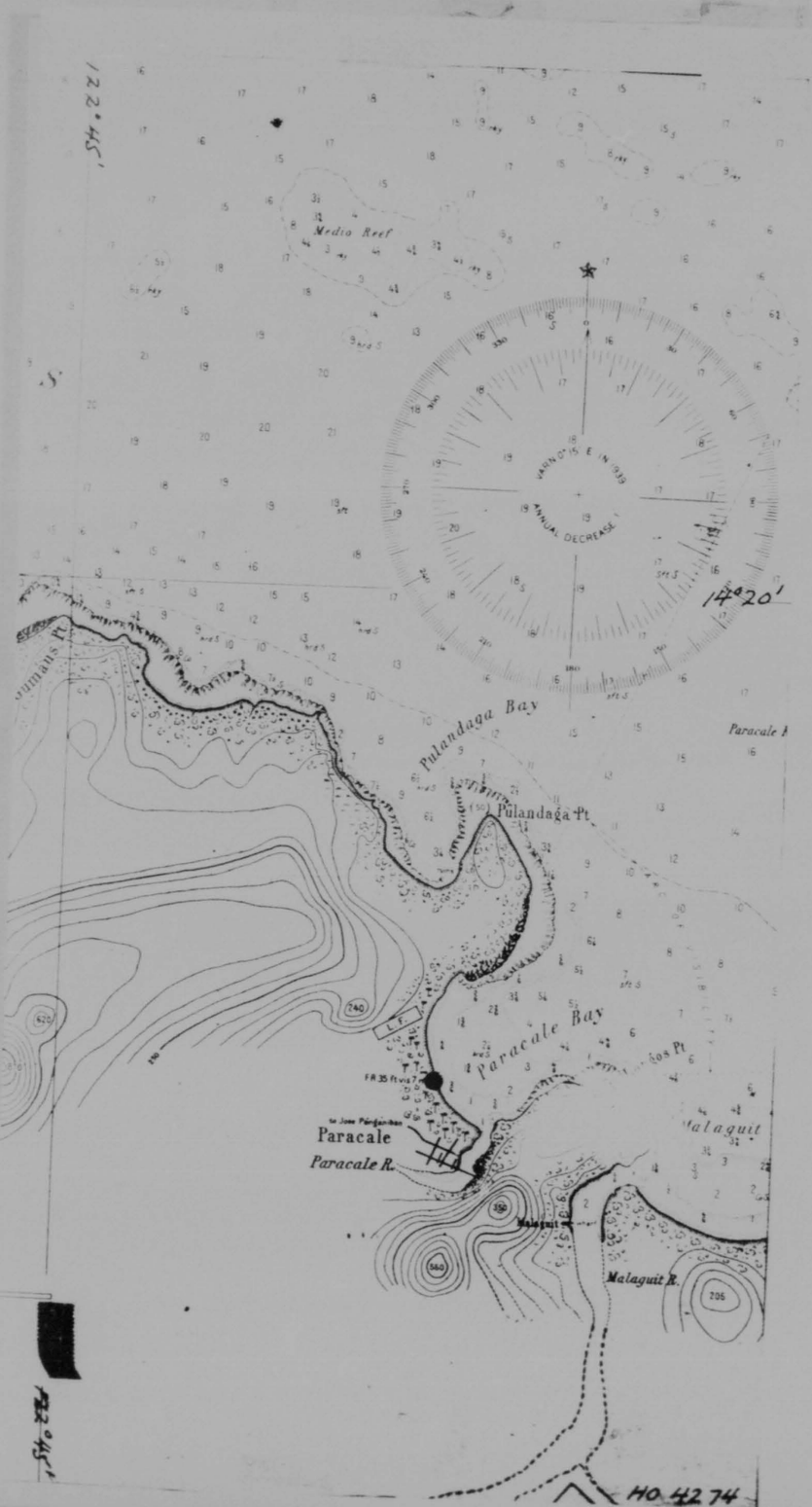


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April 1943

SECRET

SAN FERNANDO
(PHILIPPINES)

16° 37' N
120° 20' E

This is a copper concentrates shipping port. There is one pier that accommodates two vessels, one on each side. In addition, there is a small L-shaped wharf. There is no mechanical loading equipment, or structures on the piers.

The copper concentrates are trucked down from Mankayan, about 60 miles in the interior.

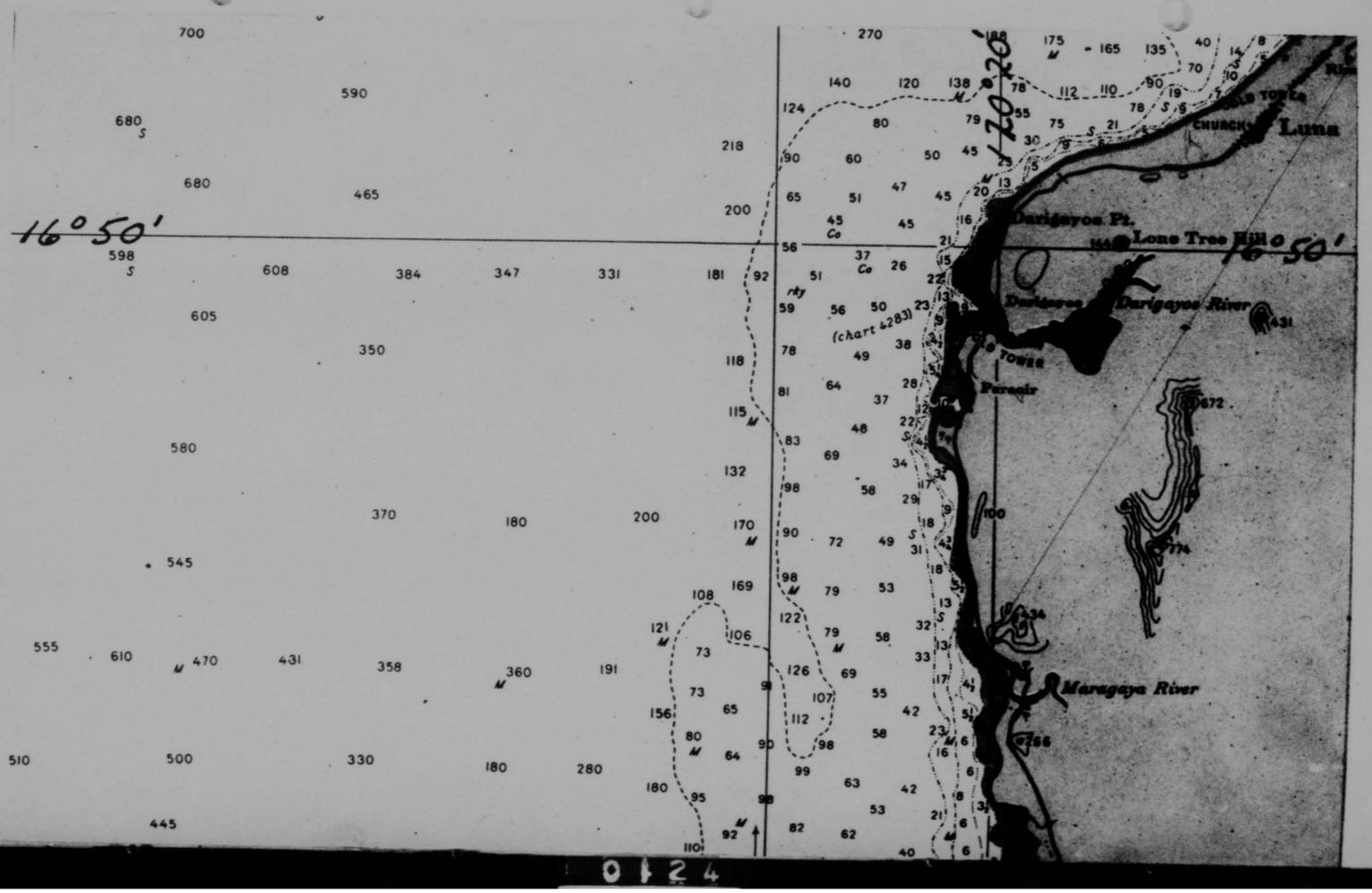
San Fernando is in the northern terminus of the RR to Manila.

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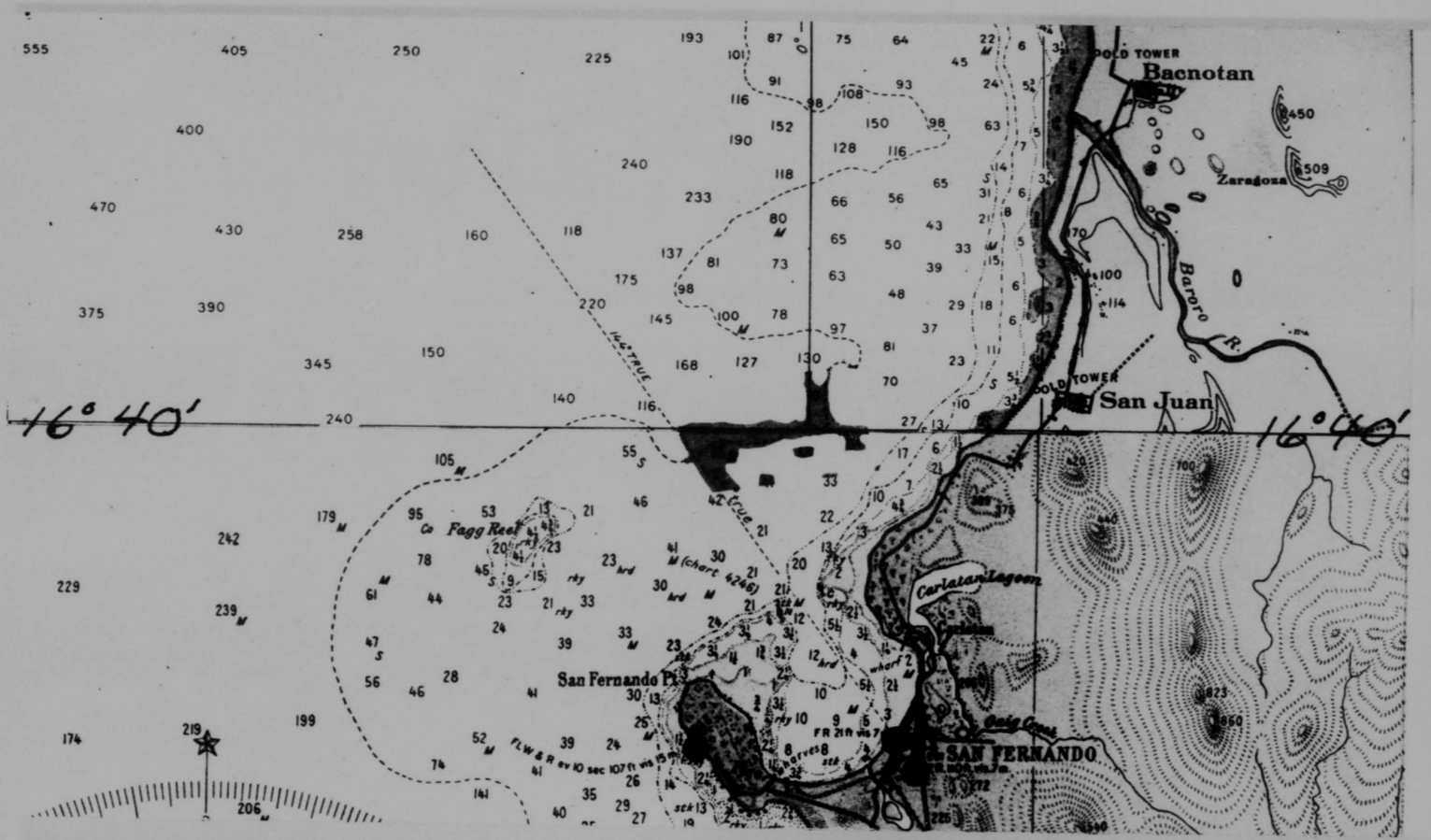


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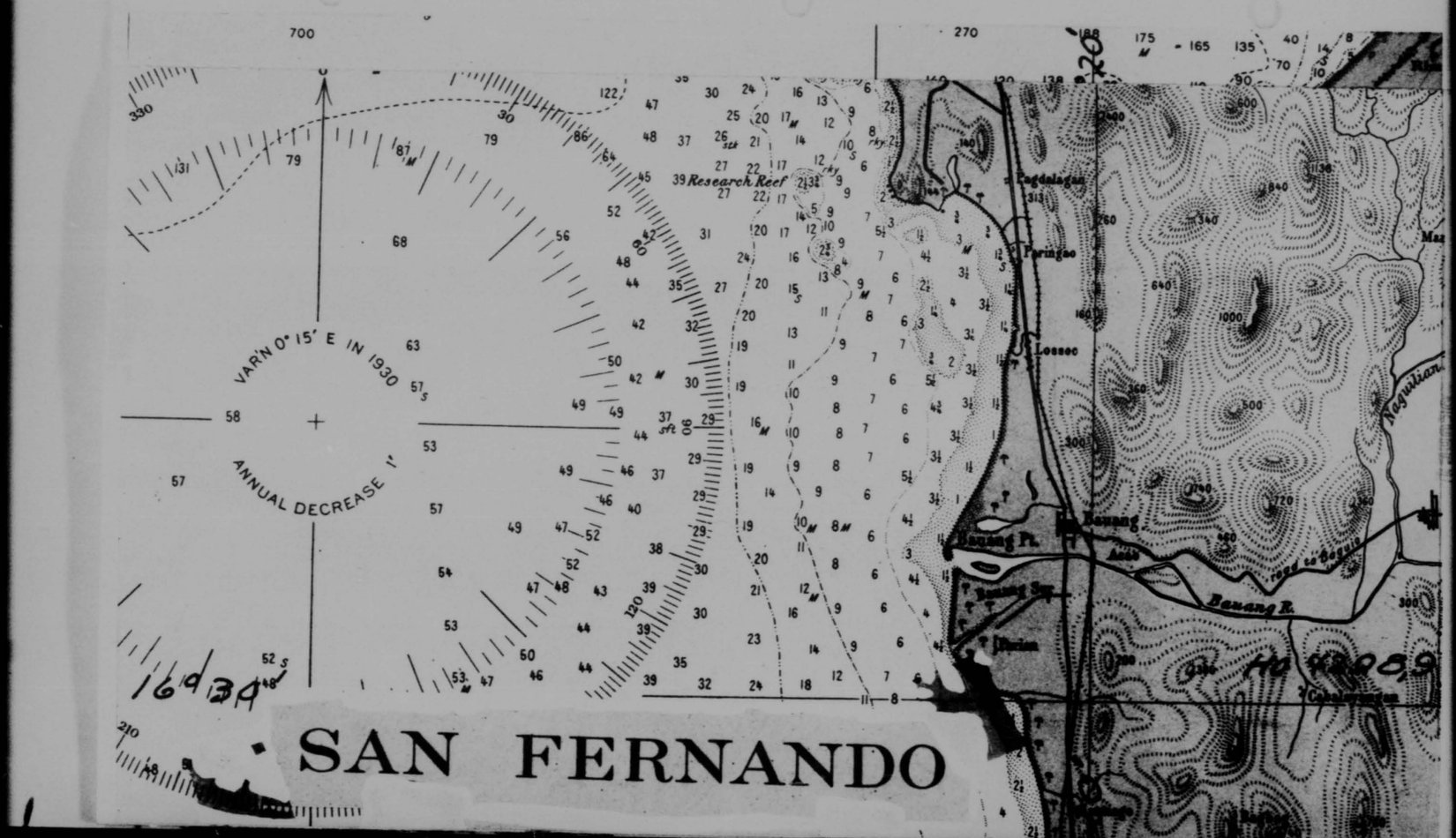


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SECRET

April 1943

CHINNAMPO (KOREA)

38° 43' N
125° 25' E

The open basin measures 840 ft on east side and 1000 ft on west side. Ships lie broadside and are served by traveling cranes and RR spurs. Four large vessels may be accommodated alongside and many may be served by lighters at the same time. There is adequate anchorage and as many as 30 warships have been observed in the harbor at one time.

The quays of the basin are of the "made land" type. Freight sheds are constructed of wood and corrugated iron. They run parallel to quayside.

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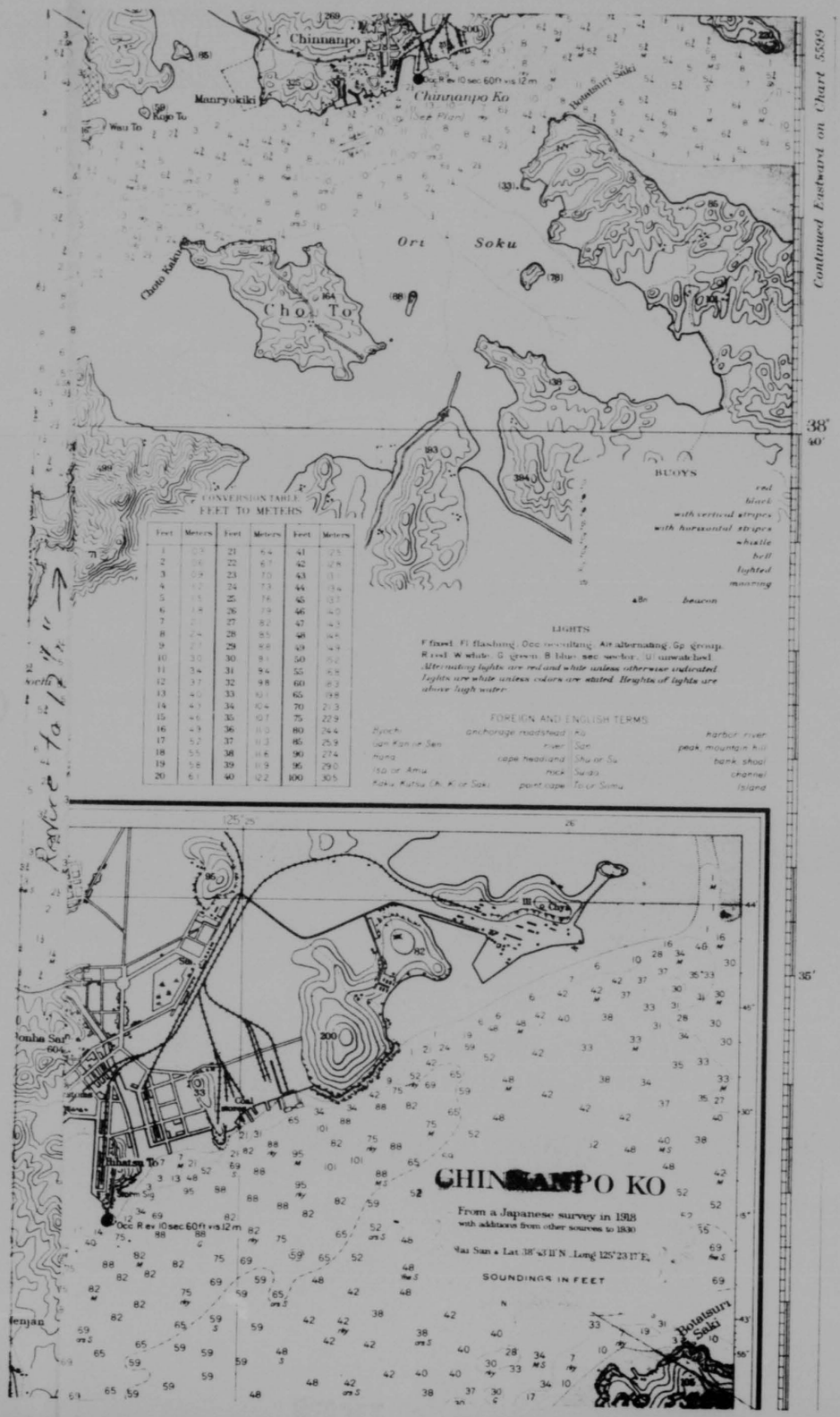
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SECRET

April 1943

FUSAN
(KOREA) 35° 06' N
129° 12' E

Fusan Harbor (Target 97) is the Korean terminus of the Fusan-Shimonoseki "Ferry Service." Here the Asiatic mainland approaches to within 150 miles of Shimonoseki Strait.

As the shipping shortage becomes more acute, the Japanese will tend to shorten, where possible, their military and industrial supply line to and from the mainland. The Shimonoseki-Fusan is the shortest crossing and the increase of seaborne traffic in this lane will be limited not by the ships available, but by the capacity of the mainland railroads and the port of Fusan.

The port facilities are limited; there are two piers. Pier 1 (south), 1966 ft long, has been used exclusively by the Shimonoseki Ferry of the Imperial Government Railways. Pier 2, 1200 ft long, has five 250 ft by 60 ft wharves and is served by seven RR tracks.

The breakwater entrance to the east of the piers is used by steamers. The breakwater entrance to the south would not be used by vessels making for the open sea because of the lack of water.

About 25 miles to the east of Fusan is Chinkai Naval Air Station (Target 93).

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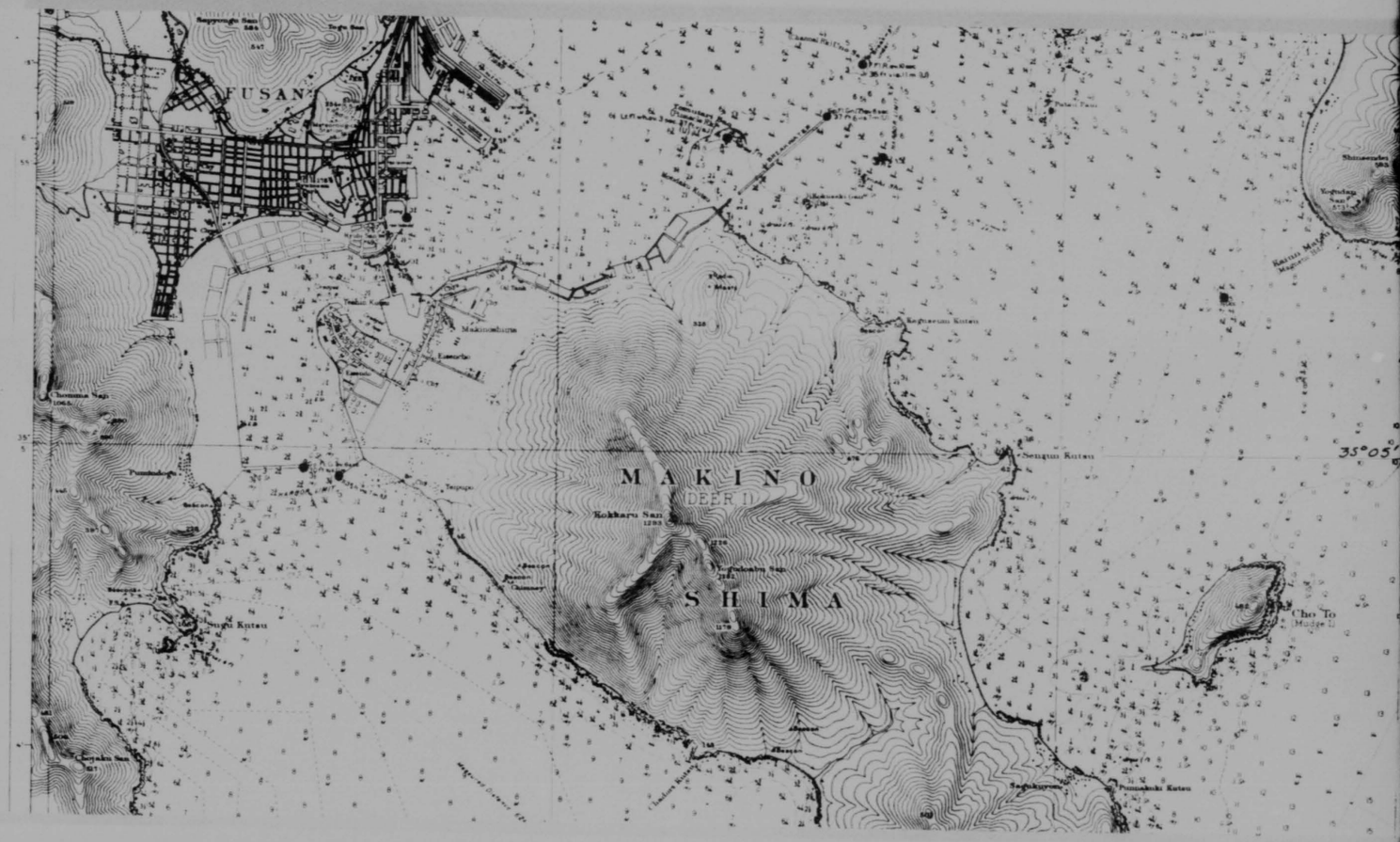
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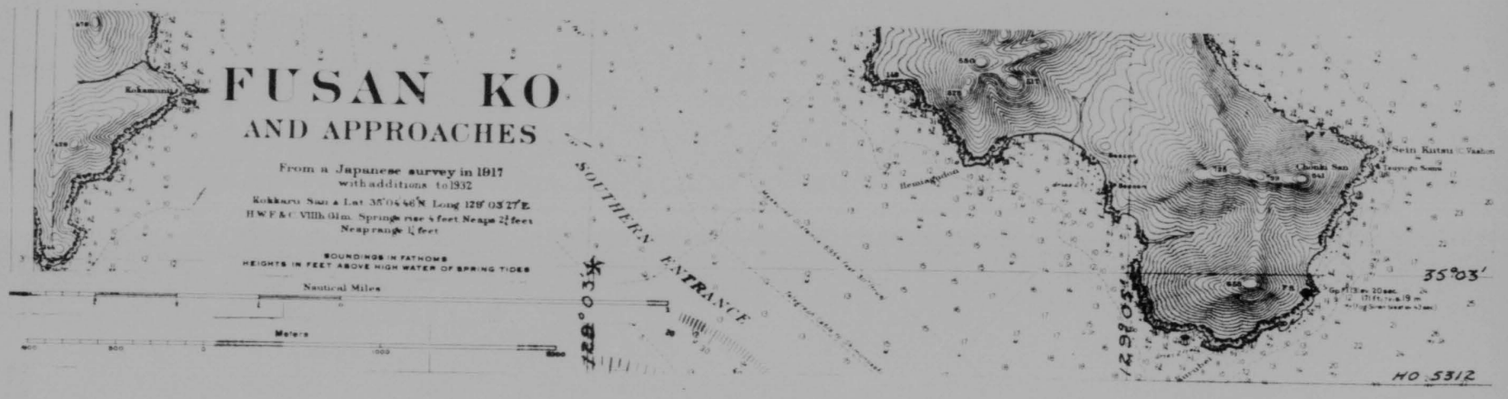
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April 1943 SECRET 39° 50' N
127° 37' E

KOSAN
(KOREA)

The pier at Kosan measures 2200 ft by 325 ft. It is of the "mole head" type. In addition, there is 2000 ft of quay berthage.

The geographic position of Kosan in relation to the north, and its relative proximity to Japan gives it some strategic importance with respect to movement of troops and military supplies.

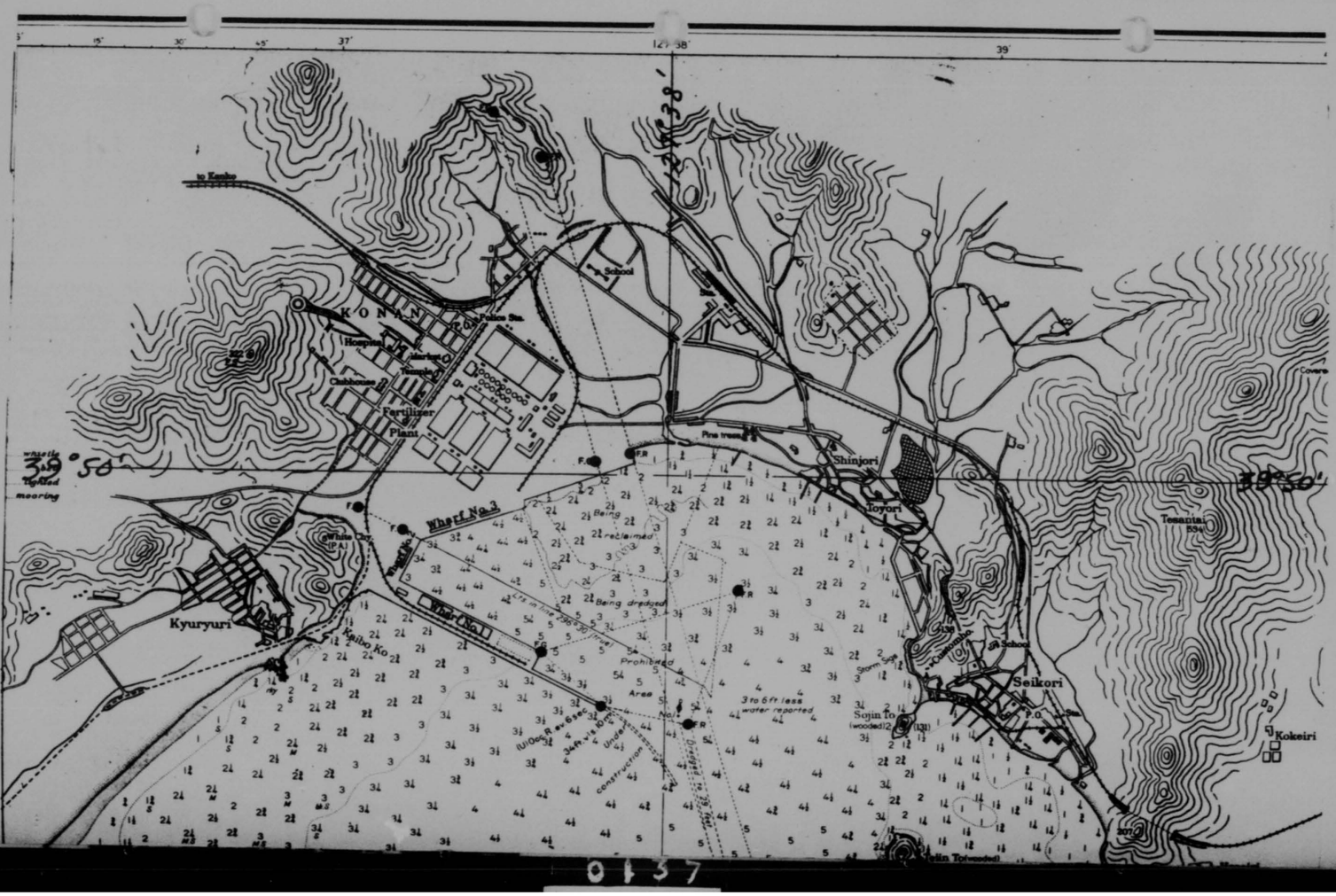
There is adequate anchorage for lighterage.

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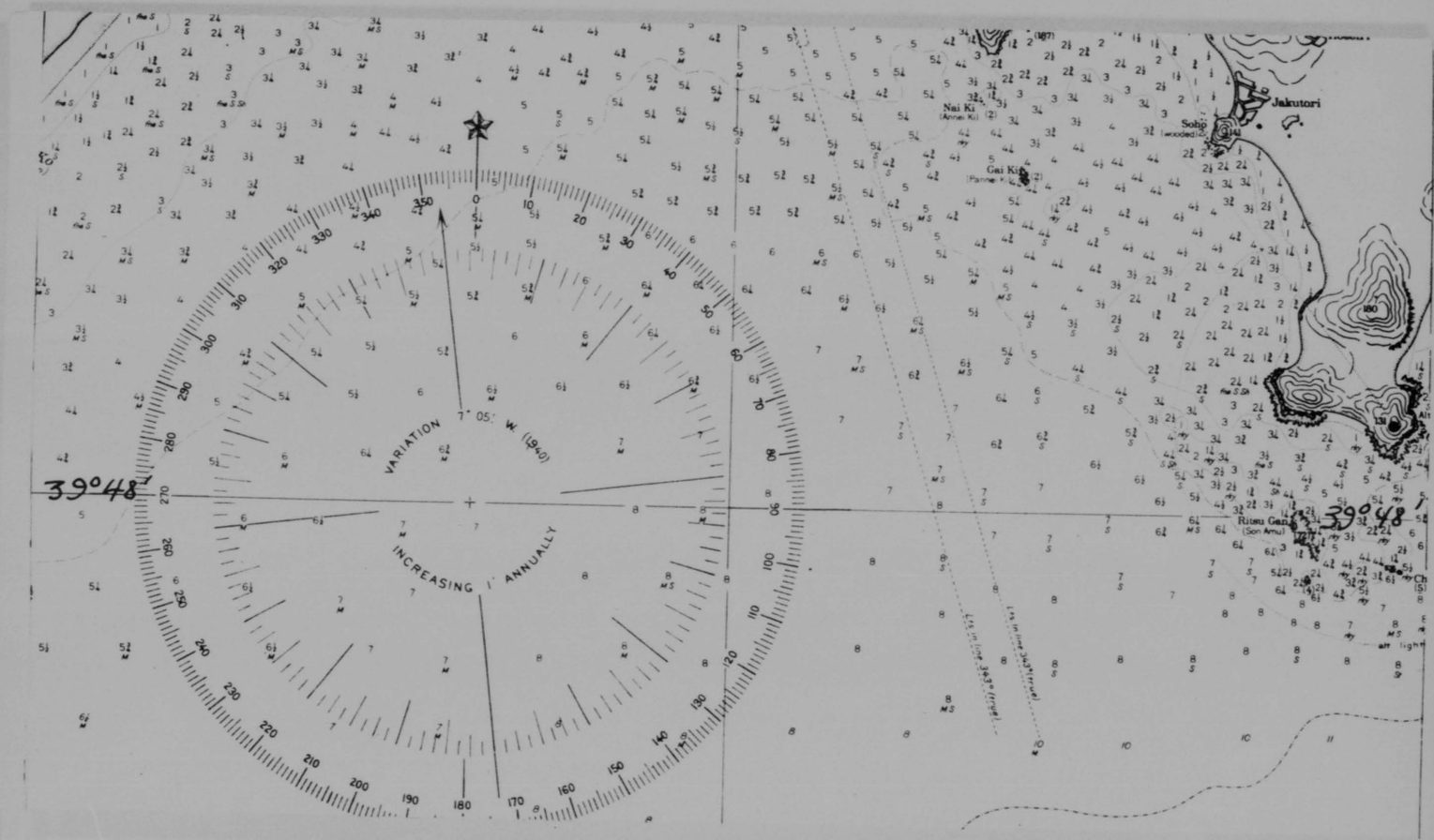
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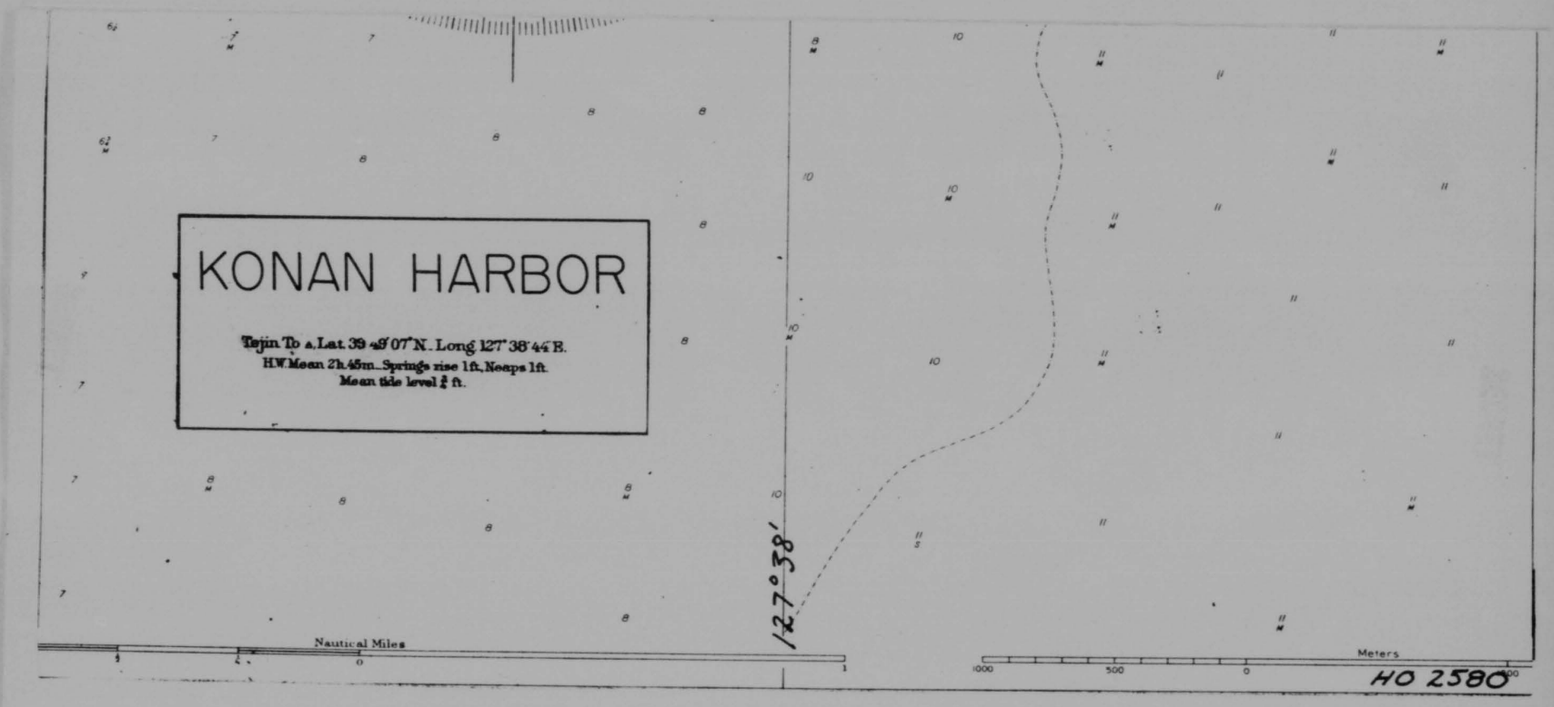


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April 1943

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RASHIN (CHOSEN)

41° 47' N
129° 50' E

Extensive harbor improvements have been carried on in this port and six piers of the "made land" type have been reported. These piers are served by RR spurs and are dredged to a depth of 30 ft.

The port is rated as a naval base with repair facilities for vessels. There is adequate anchorage for many vessels.

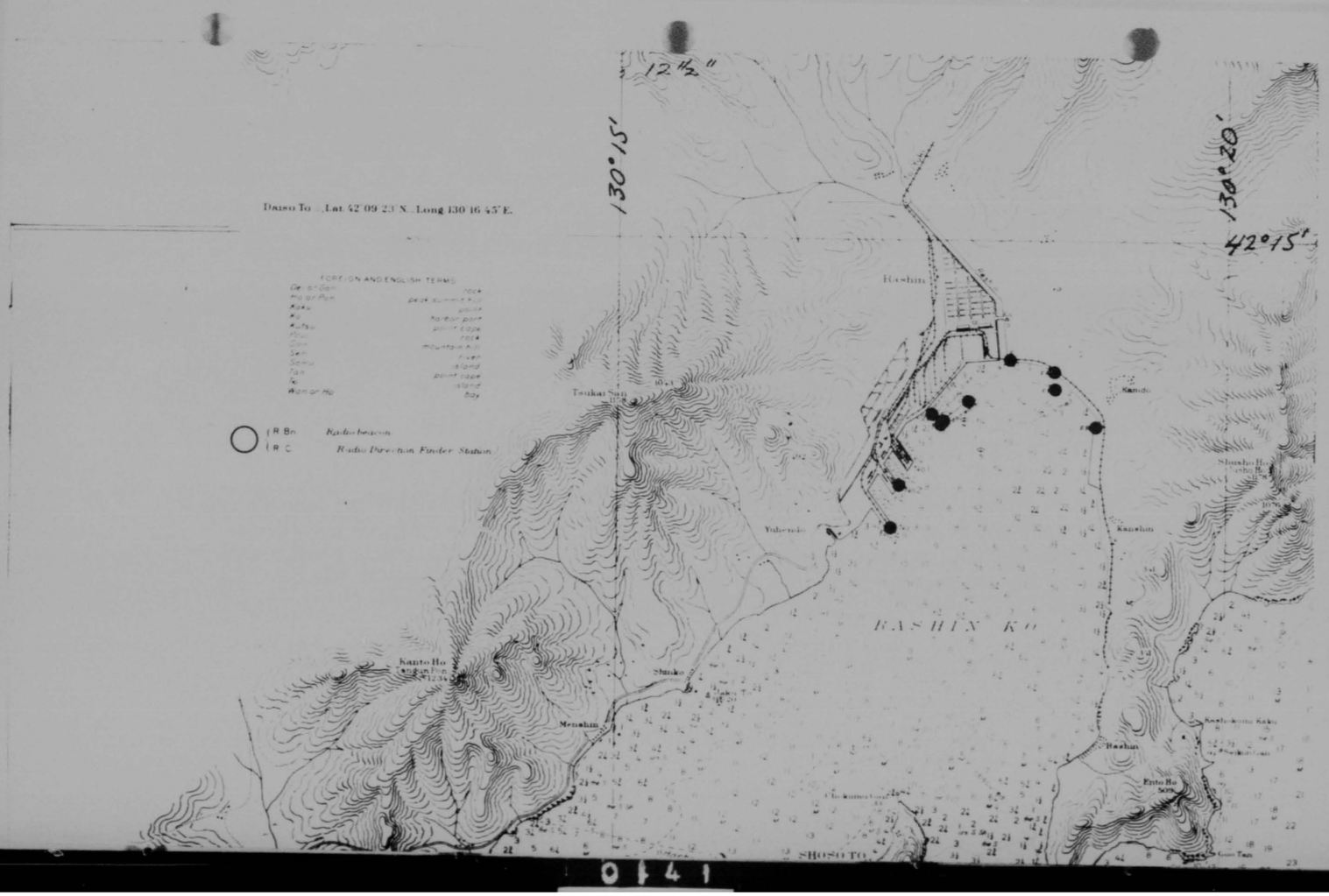
This port is considered of great military importance with respect to movement of troops and supplies.

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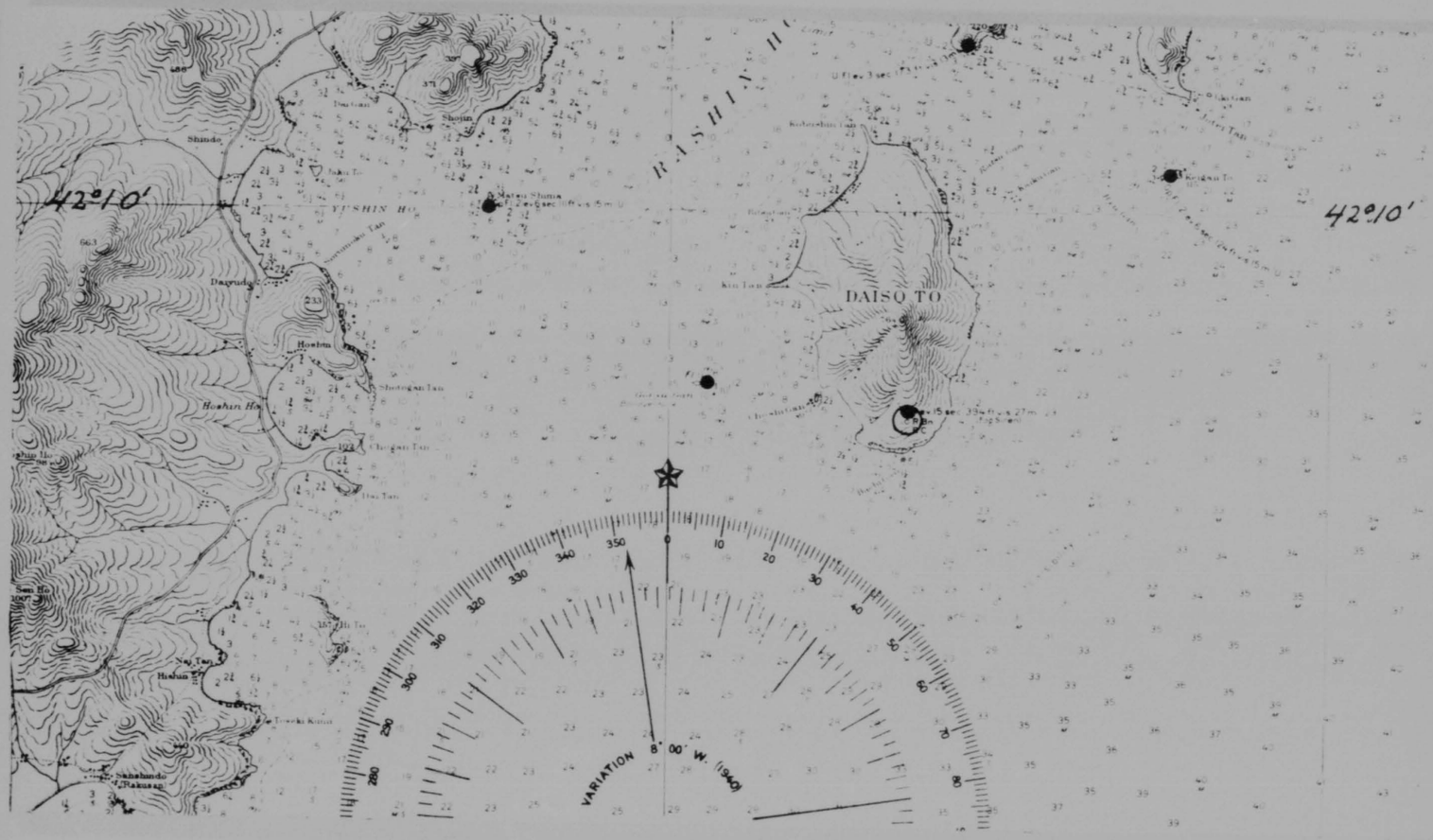


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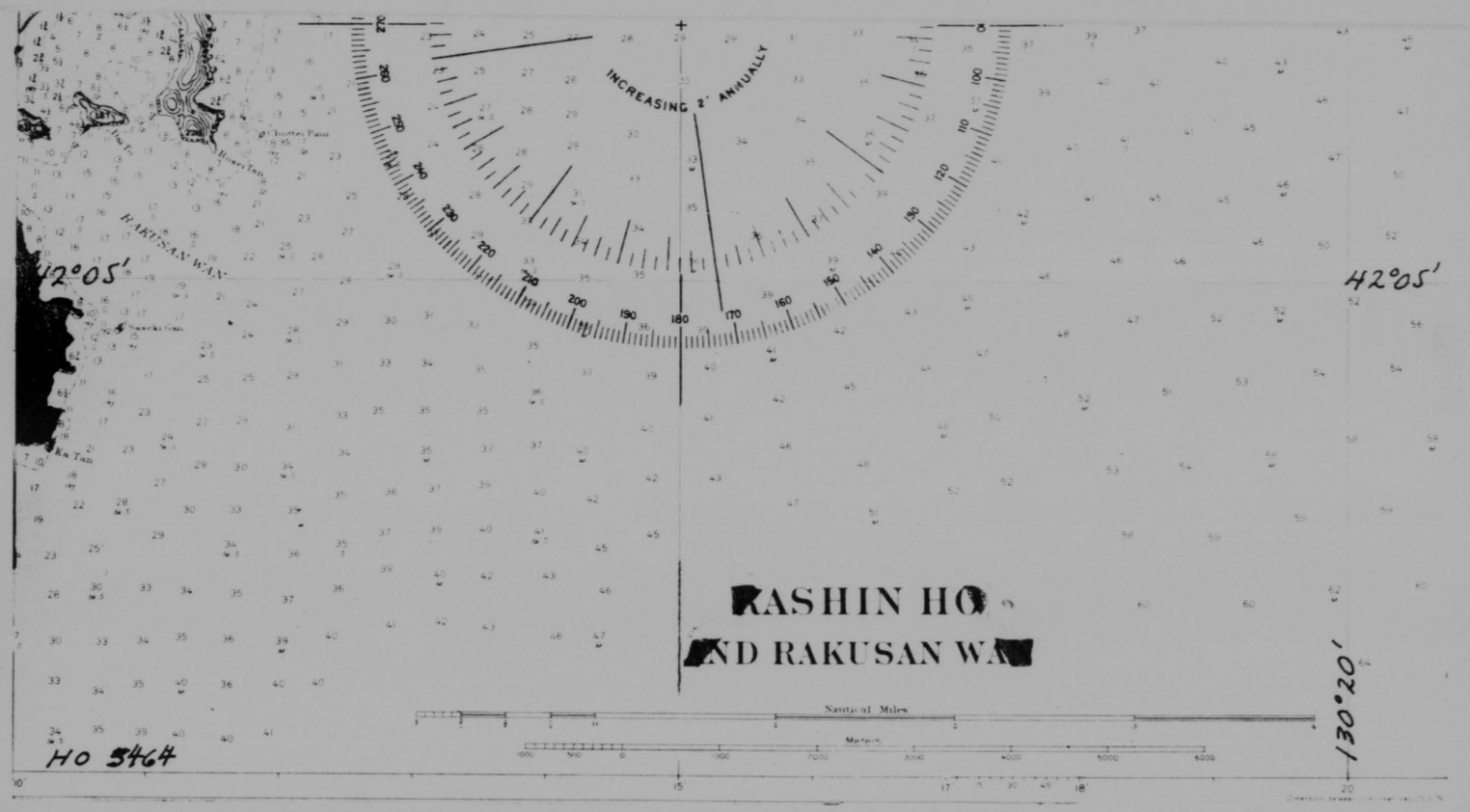


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April 1943

SEISHIN (CHOSEN)

41° 47' N
129° 50' E

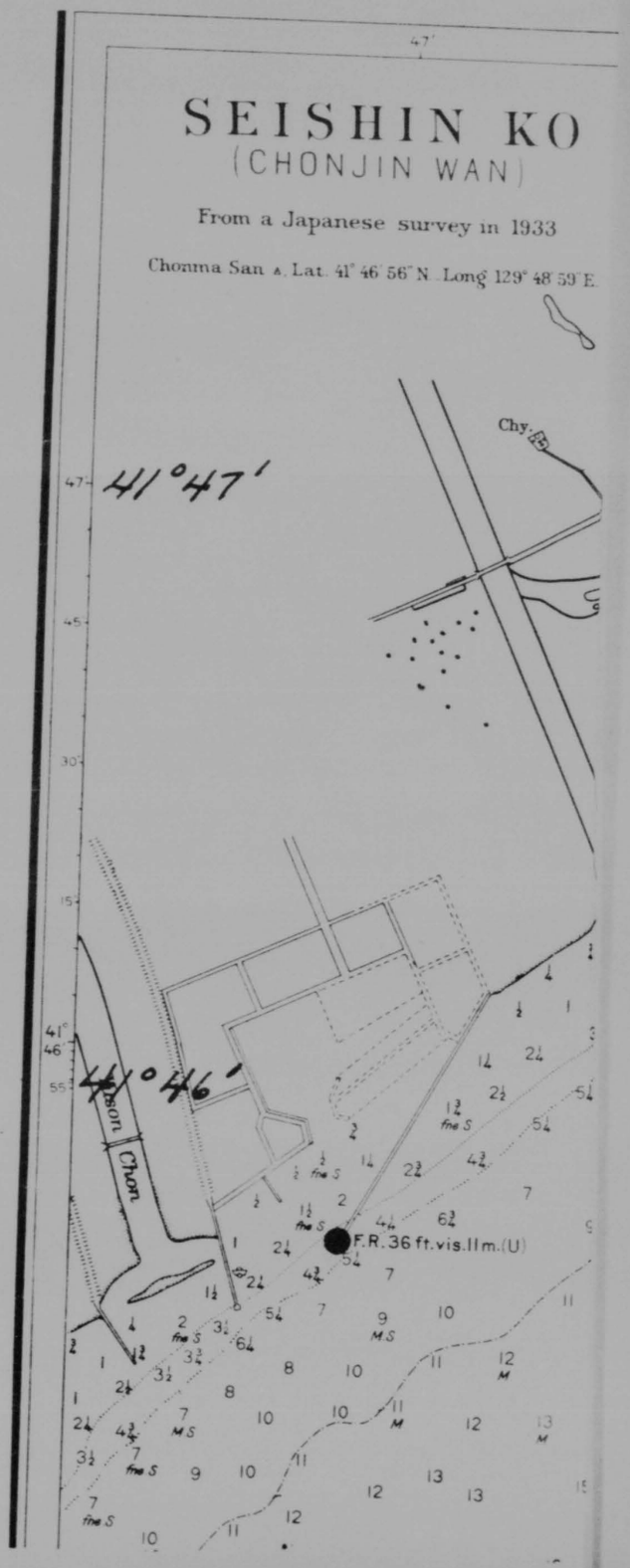
The port of Seishin is protected by a mole. North of this mole is quayage measuring 3000 ft for berthing broadside. Warehouses and RR spurs serve the quays.

Seishin is not only important for industrial shipping, but also as a naval base with repair facilities. It is a point of transhipment for troops and military supplies.

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April 1943 SECRET

KOBE - OSAKA 34° 40' N
(JAPAN PROPER) 135° 20' E

Considered together, the ports of Kobe and Osaka offer ship concentrations second in importance only to those to be expected in the Shimonoseki Strait ports. The Kobe - Osaka area is one of the most heavily industrialized regions of Japan, and vast tonnages of shipping are required to supply the coal, ore, and other materials needed by these industries. In addition, very large quantities of chemicals and manufactured products are exported from these ports.

Kobe is a "C"-shaped, "breakwater" port, the area enclosed by breakwaters being approximately 11,000,000 square yards. Ship concentrations can be expected both in this inner harbor and in the area just east of the central breakwaters. In addition to its importance as a cargo port, Kobe is also the site of the huge Kawasaki Dockyard, and many incomplete or damaged ships will be found moored at the south end of the inner harbor. The port is equipped with 6 main piers and wharves (as well as numerous jetties), all equipped with mechanical loading devices, RR spurs and storehouses. There are 3 main entrances to the inner harbor, and ships surprised there during a raid may make for the open water to the south.

Like Kobe, Osaka is important both as a cargo port and a shipbuilding and repair port. The main harbor is formed by two long breakwaters, opening to the west. The entrance is narrow and ships trying to make open water will have to file out singly. Ships will be found in secondary inner anchorages to the north and south of the central anchorage. The central harbor is equipped with 9 main wharves and piers, all equipped with mechanical loading devices, RR spurs and storehouses. Some ships can be expected just north and south of the entrance to the central harbor.

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KOBE



Kobe

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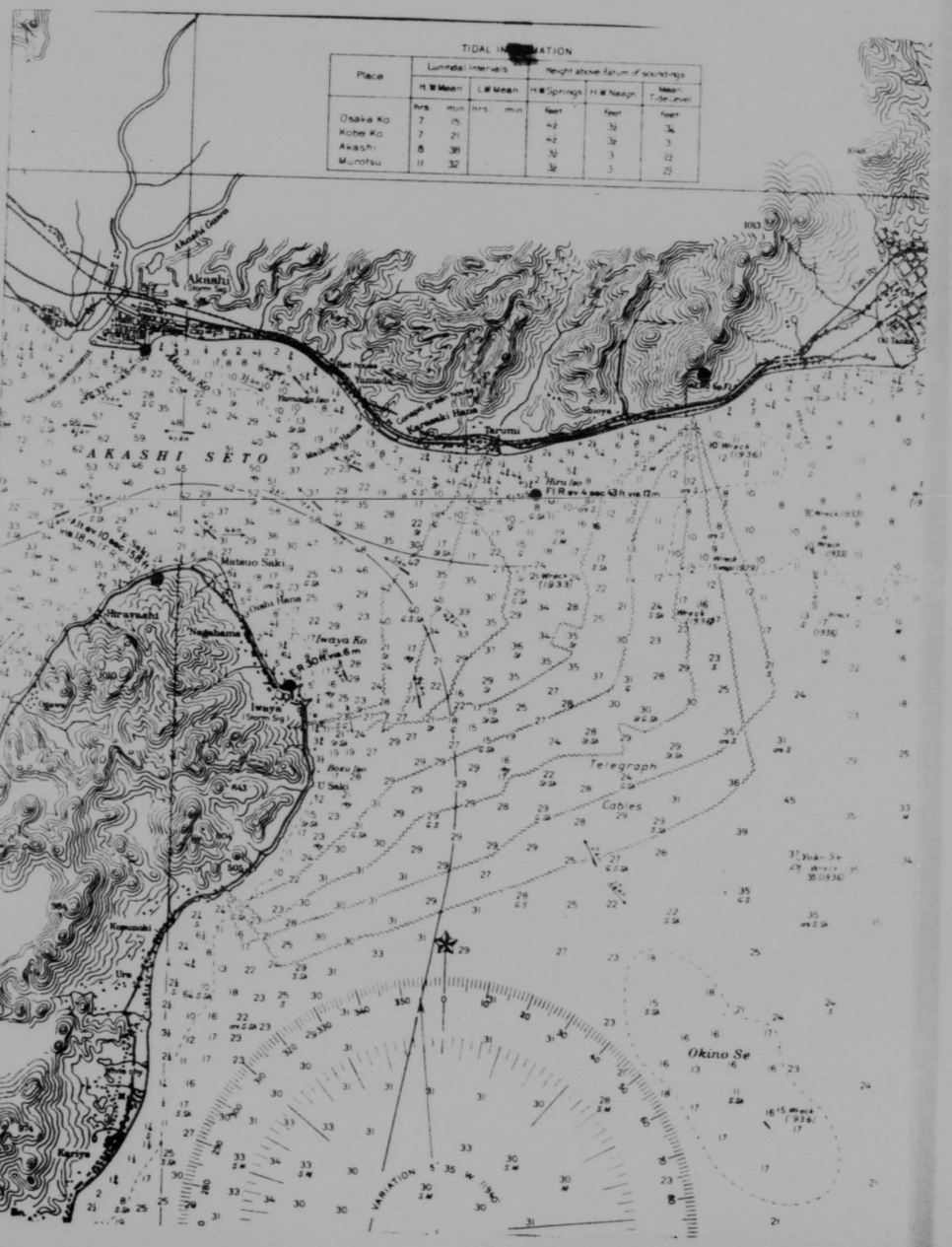


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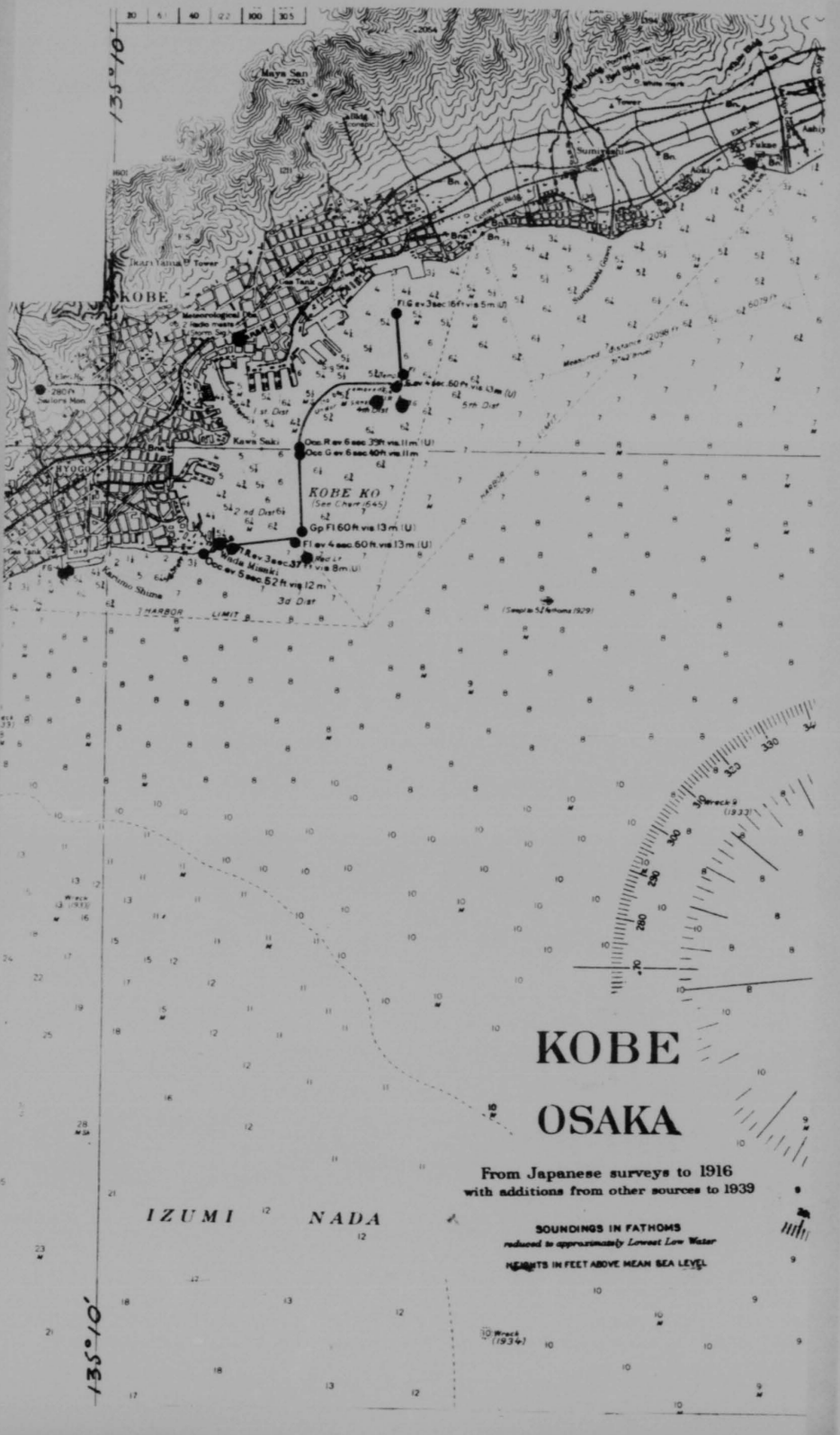
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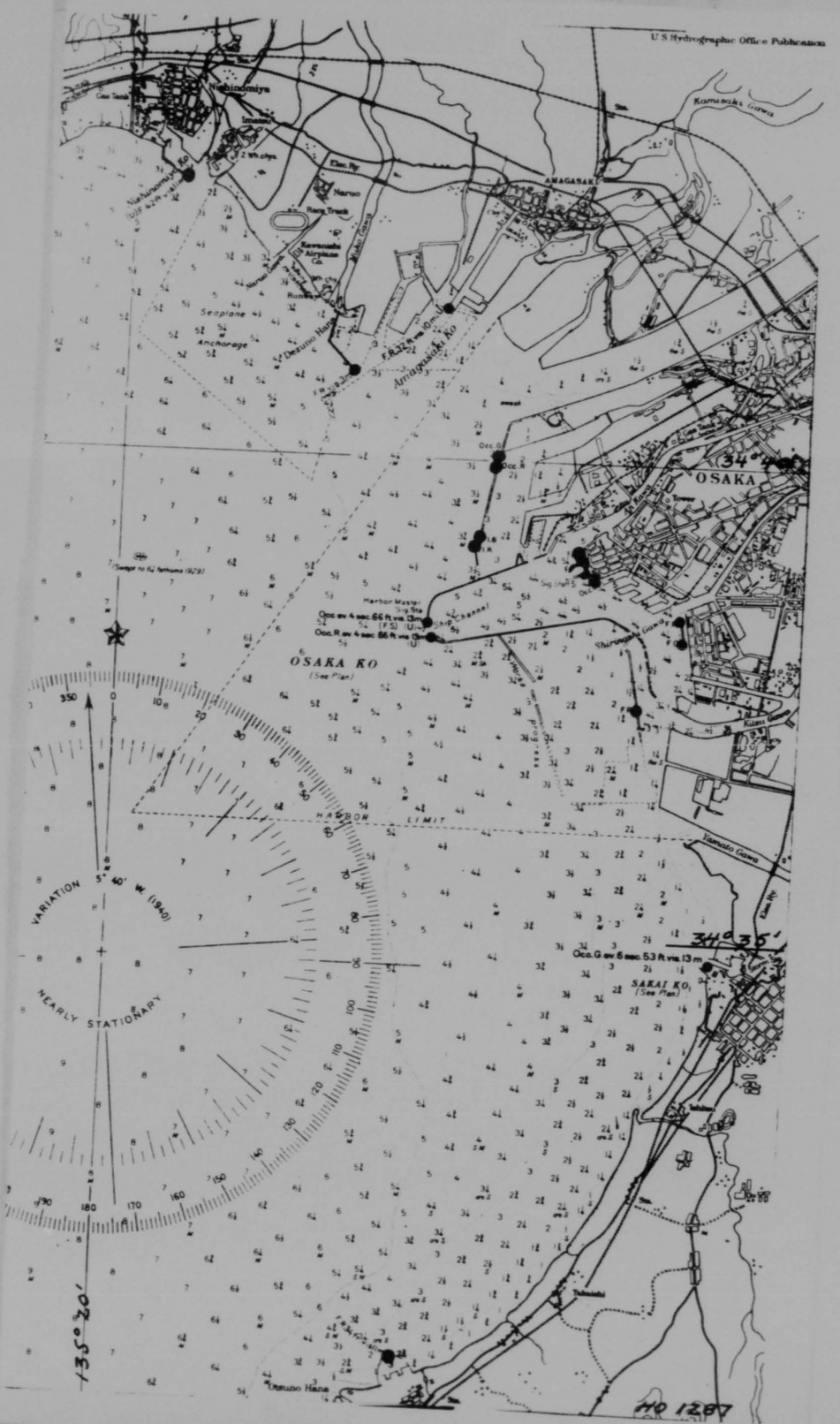
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April 1943 SECRET

MIIKE 33° 00' N
(JAPAN PROPER) 130° 25' E

Miike Harbor (Target 1054) is a completely artificial harbor of the "basin" type. Dredged in flats that dry at low tide, it consists of an Inner Harbor and a Wet Dock.

The Inner Harbor is approached thru a channel 1 mile long, dredged between training walls of the breakwater type. The Inner Harbor (Area 125 acres) and the channel are dredged to a minimum depth of 24 feet for the entrance of vessels to the Wet Dock during high tide.

The Wet Dock (Area 30 acres) is entered thru a lock-gate 66 ft wide. This gate is steel, hinged to concrete, and electrically operated. Vessels enter this dock at high tide; the closed lock gate maintains the high water level as the water recedes from the Inner Harbor and Approach Channel.

The coal storage yards to the north of the Wet Dock, as well as the RR yards to the west and the coke storage yards on the south, extend onto "made land" beyond the beach line.

The East side of the Wet Dock (1300 ft in length) has berthing space for 3 vessels and is equipped with 3 sets of mechanical coal loaders, each with a capacity of loading 5000 tons of coal in 24 hours.

On the South side of the Wet Dock is a 300 ft steel wharf for general cargo, accommodating a 4000-ton vessel.

The mechanical coal loaders are on trucks and can be moved for adjustment to hatch openings as ships of different sizes come alongside for loading. The coal is taken directly from RR cars and carried by chain buckets to gravity slow hatch chutes.

In the event of air attack, vessels in the Wet Dock could not, except at high tide be moved to the Inner Harbor or run for open water. Vessels sunk alongside the coal loaders would impair the use of the loaders till raised. The channel to the Inner Harbor has a width of 150 ft at the bottom, and would not necessarily be blocked by a sinking.

Destruction of the Wet Dock locks to would greatly impair the value of the port.

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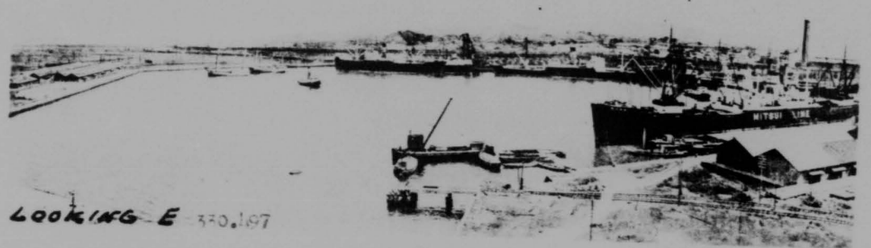
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MIIKE HARBOR
(WET DOCK)



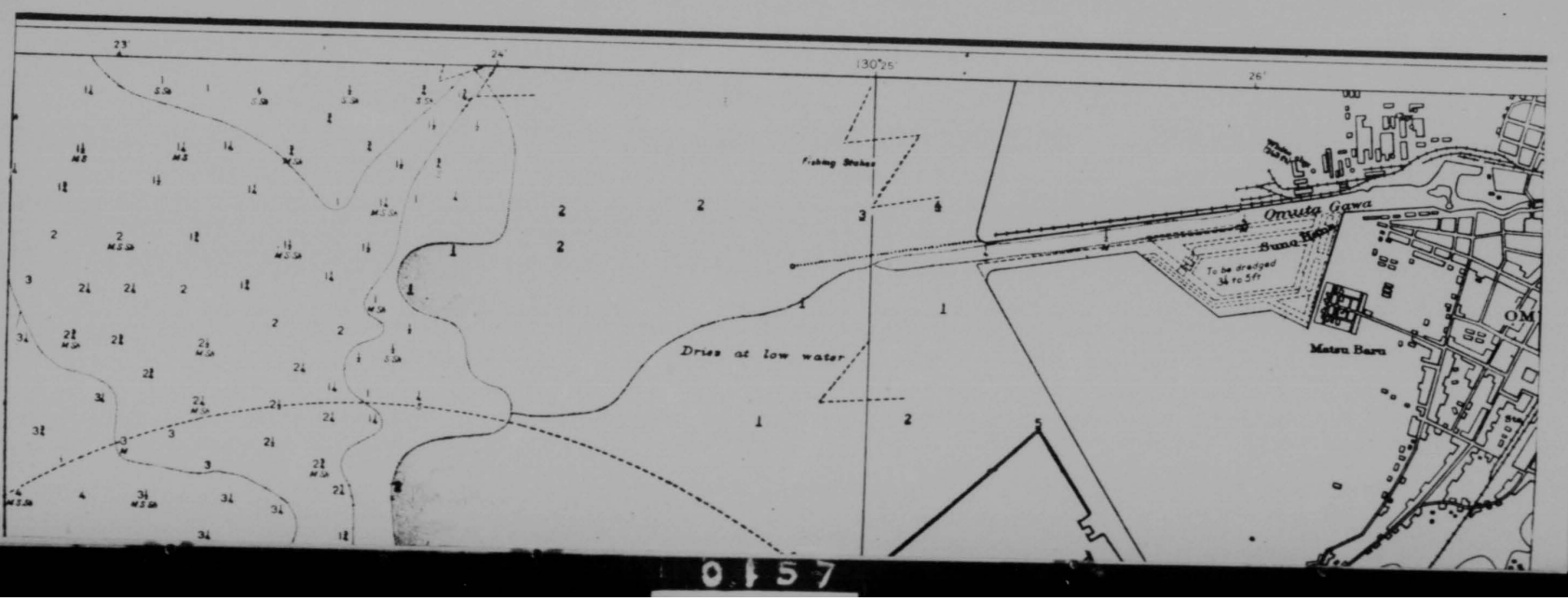
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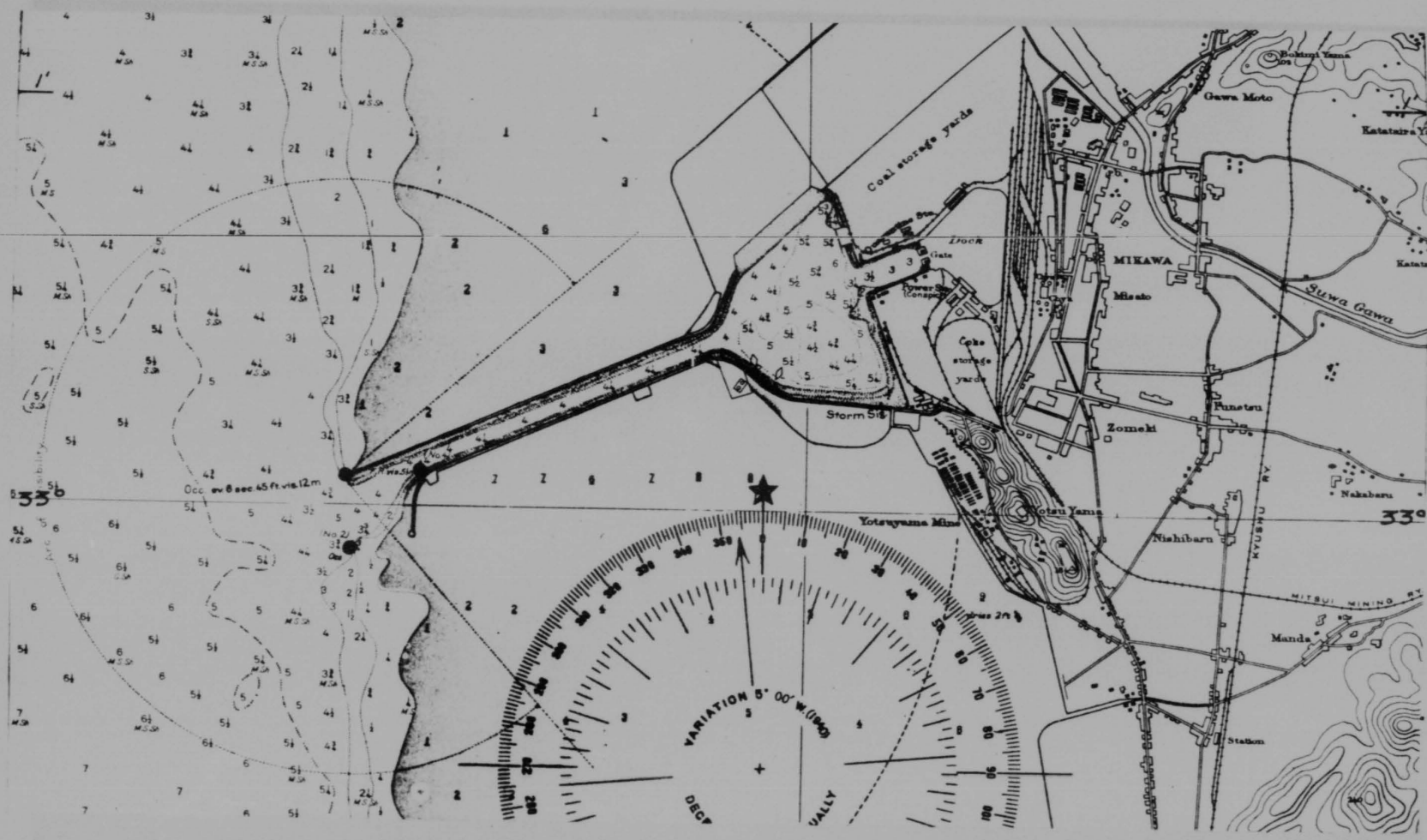
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April 1943 SECRET

MURORAN 42° 20' N
140° 59' E
(JAPAN PROPER)

Muroran is important both as a coal export port and as a destination port for iron ore. It is estimated that about 5,500,000 tons of coal are exported from this port every year. This, plus the ore requirements of Muroran's two steel mills, results in a heavy concentration of shipping.

There are 4 large piers (Targets 381 a,b, c & d) and a general cargo wharf - all located at the SW end of the harbor. Two of the piers are equipped with mechanical coal loaders, the destruction of which would limit severely the export of coal, since labor for manual loading is believed scarce here. Extensive RR yards extend inland from the piers, and spurs connect with the steel mills.

Ships waiting to load or unload will be found anchored just NW of the piers. A few ships, loading paper pulp, will be found at the north end of the port.

The well-sheltered harbor is triangular in shape. Steep hills rise to about 500 feet on all sides.

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MURORAN

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LOOKING S

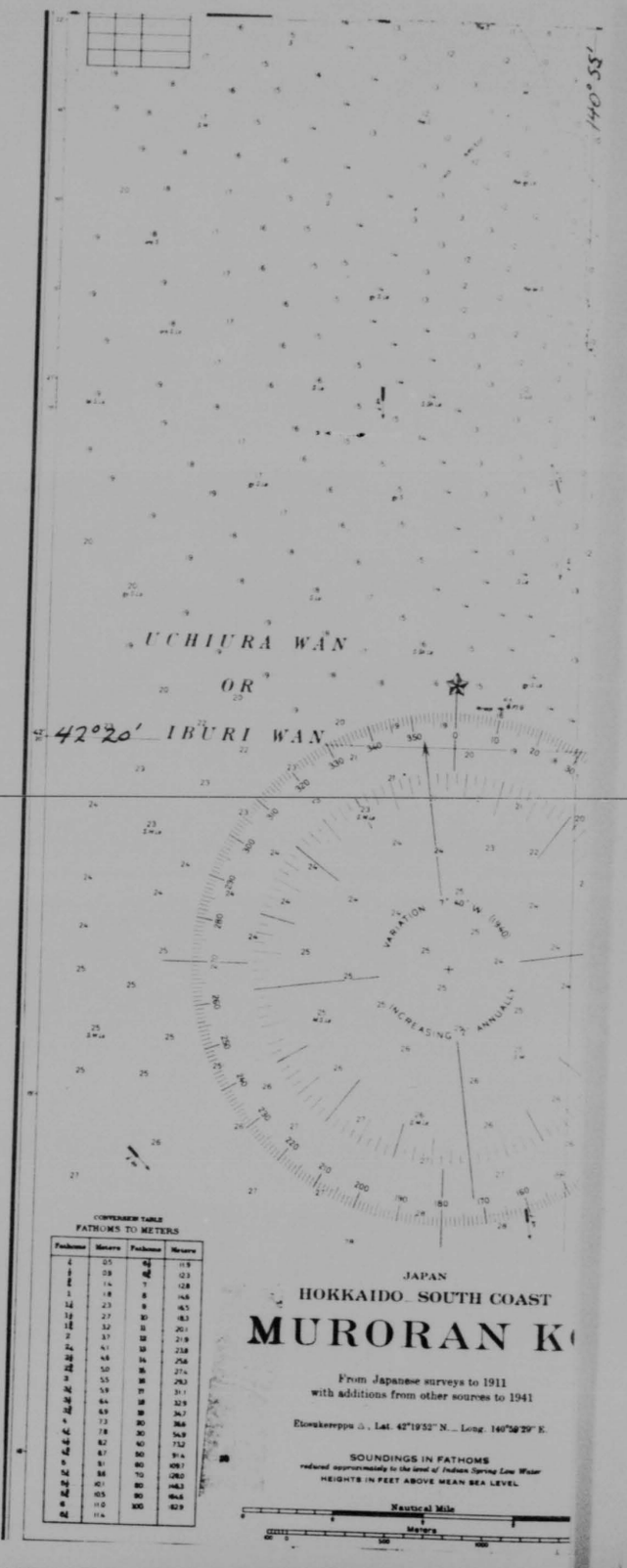
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April 1943

SECRET

NAGASAKI

(JAPAN PROPER)

32° 44' N
129° 52' E

The port of Nagasaki is long and narrow, extending in a general NE/SW direction for approximately 4000 yards. All important loading and storage facilities are located at the NE end of the harbor where two wharves (Targets 835 and 836) are available. Most cargo is handled by lighter but medium-sized vessels can berth alongside the southern wharf. About 30 storehouses are located on the wharves and a RR freight yard occupies the northernmost part. Large ships anchor just west of the southern wharf (Dejima Wharf).

The important Mitsubishi shipyards are located west across the bay from these wharves. Fuel oil for bunkering is available at Kozaki Point.

A naval anchorage is located to the south of the port of Nagasaki Proper - in the Koyagi Strait. A shipyard is located on the Northern part of Koyagi Island, west of the naval anchorage.

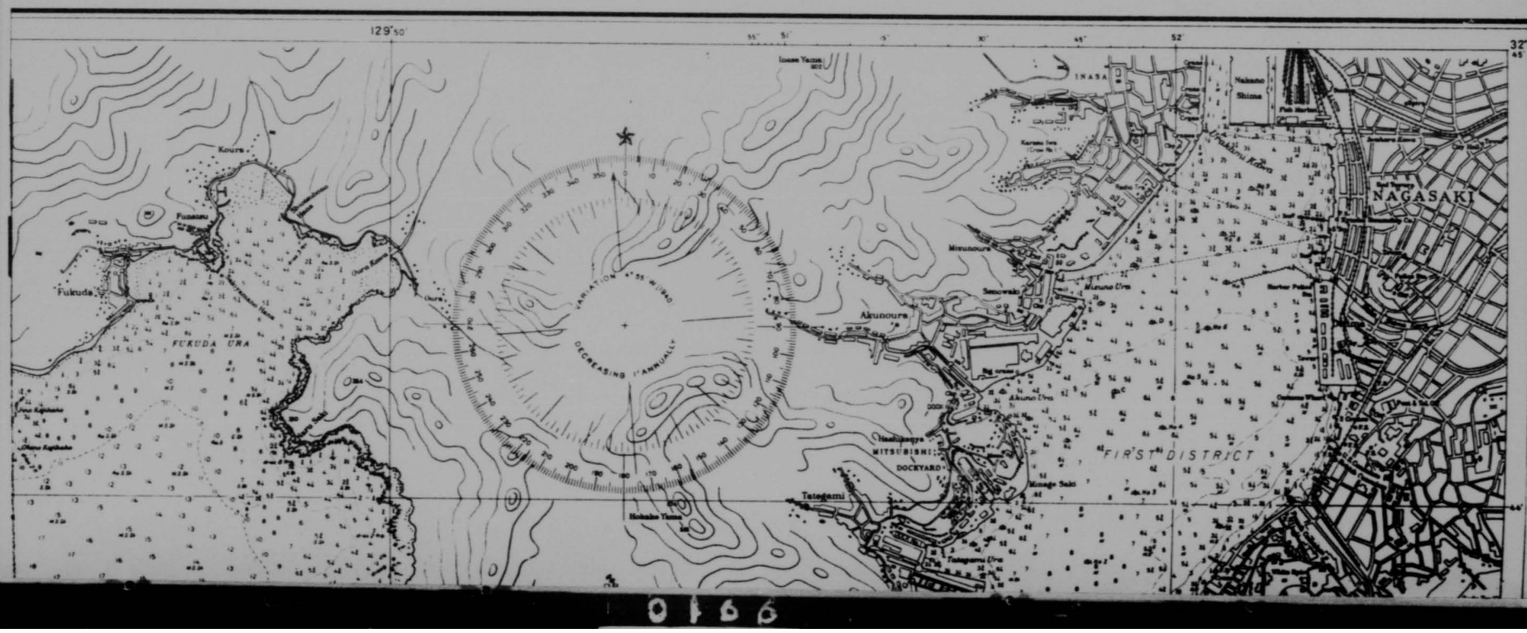
The port of Nagasaki is the terminus of regular steamship service with Shanghai. It also serves as an important embarkation port.

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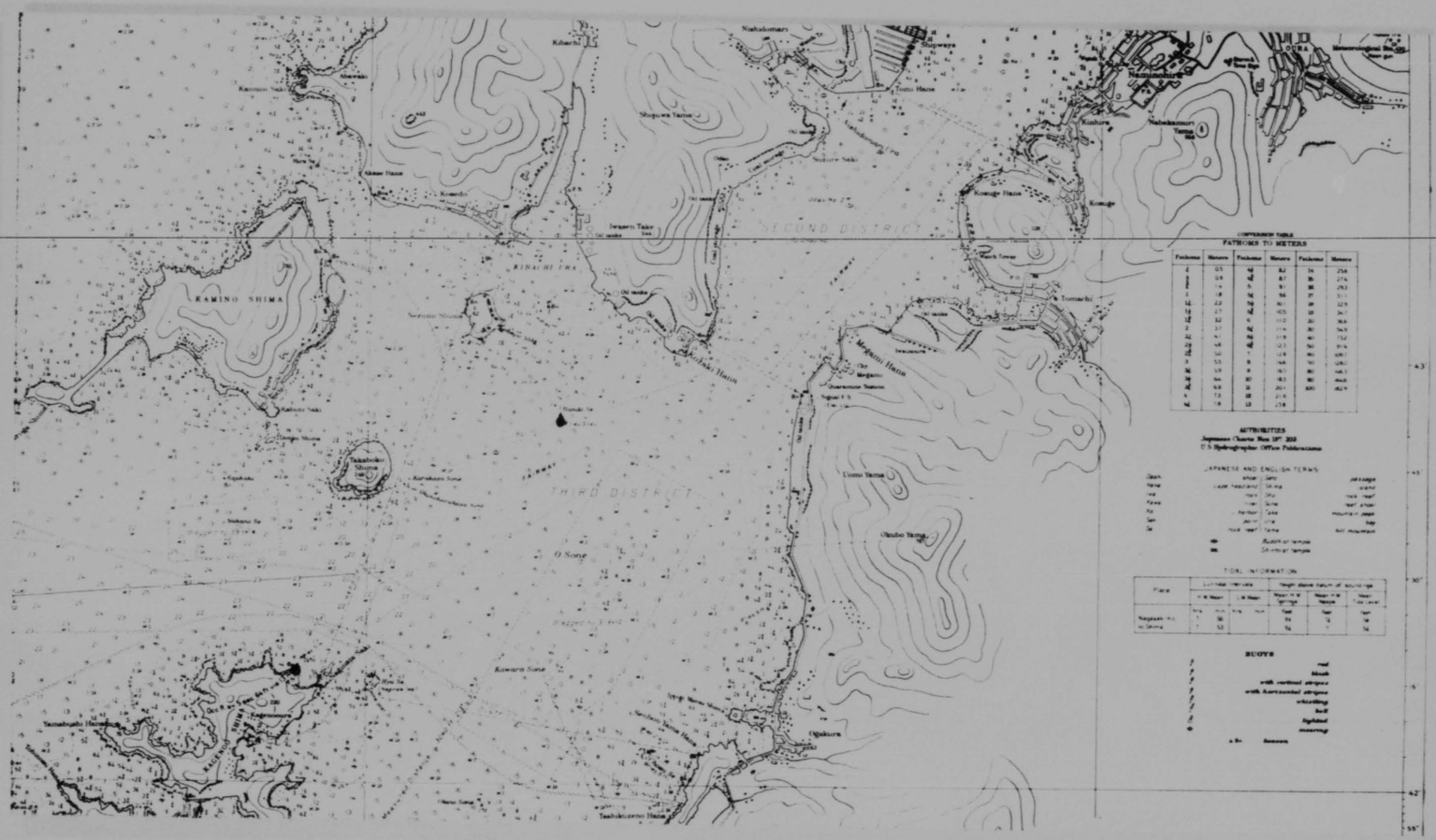
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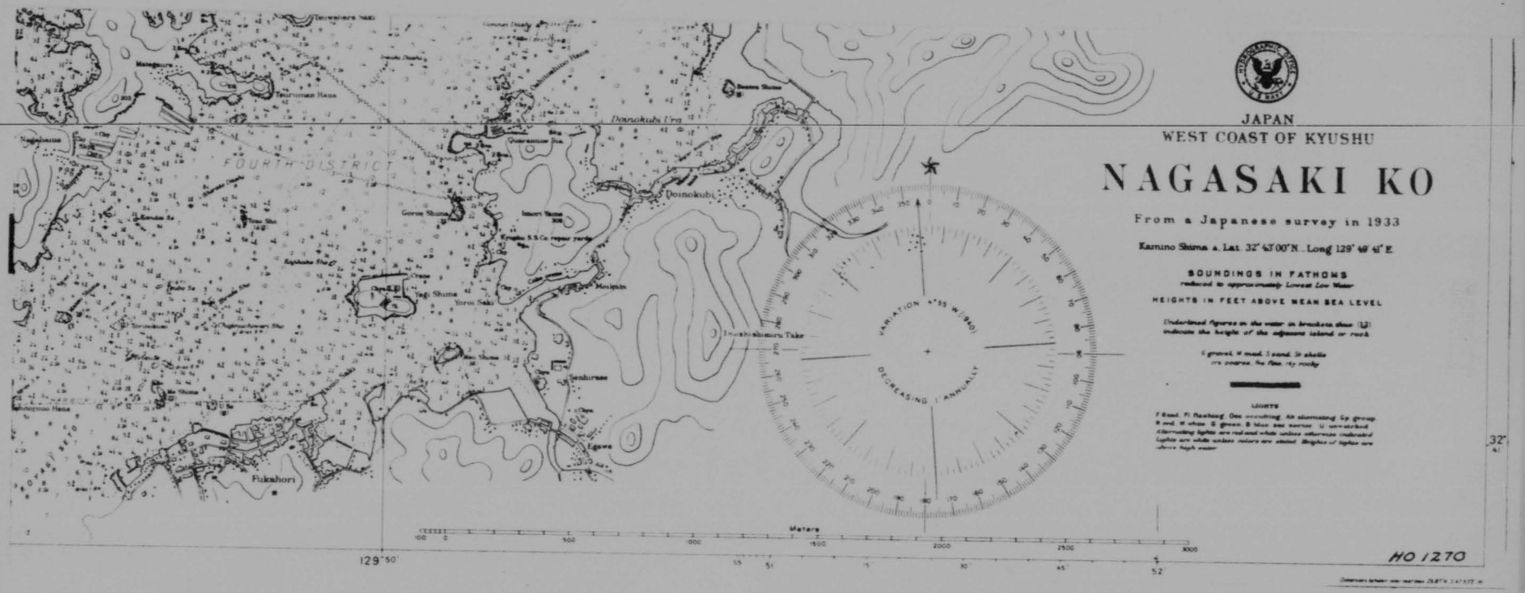


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April 1943 SECRET

NAGOYA 35° 05' N
136° 53' E

(JAPAN PROPER)

Nagoya Harbor is a "breakwater" port, the entrance to which is formed by two long breakwaters. The square-shaped inner harbor measures about 1½ miles on each side, but only the western half is dredged to a depth which can take ocean-going vessels. Therefore, all vessels not berthed alongside the piers at the head of the harbor will be anchored in a general N/S line along the western half of the harbor.

All important loading facilities (Target 251) are to be found at the head (north side) of the harbor, where three piers, each capable of berthing two ships, are available. Railroad spurs run on to each pier and connect with the Nagoya Railroad Station in the northern part of the city. About 15 storehouses are located on these piers and additional storehouses are located just to the north. They vary in construction from wood to ferro-concrete.

A small drydock is located on the eastern side of the harbor. Fuel oil for bunkering is available at the northern end of the east breakwater (southern side of the harbor).

In the event of a surprise air attack it is believed that the ships that anchor in the inner harbor will remain there rather than risk the chance of being sunk in the long, narrow entrance channel and thus blocking the harbor. Two canals lead from the northern part of the harbor to the middle of Nagoya City. These are connected with barges which offer secondary targets.

The predominant tonnage (by volume) moving into this port is industrial coal. While Nagoya ranked as Japan's fourth busiest port in peacetime, it is believed that the war has diverted much of the shipping to other ports and that the present volume of shipping entering and clearing from this port is probably less than in peacetime.

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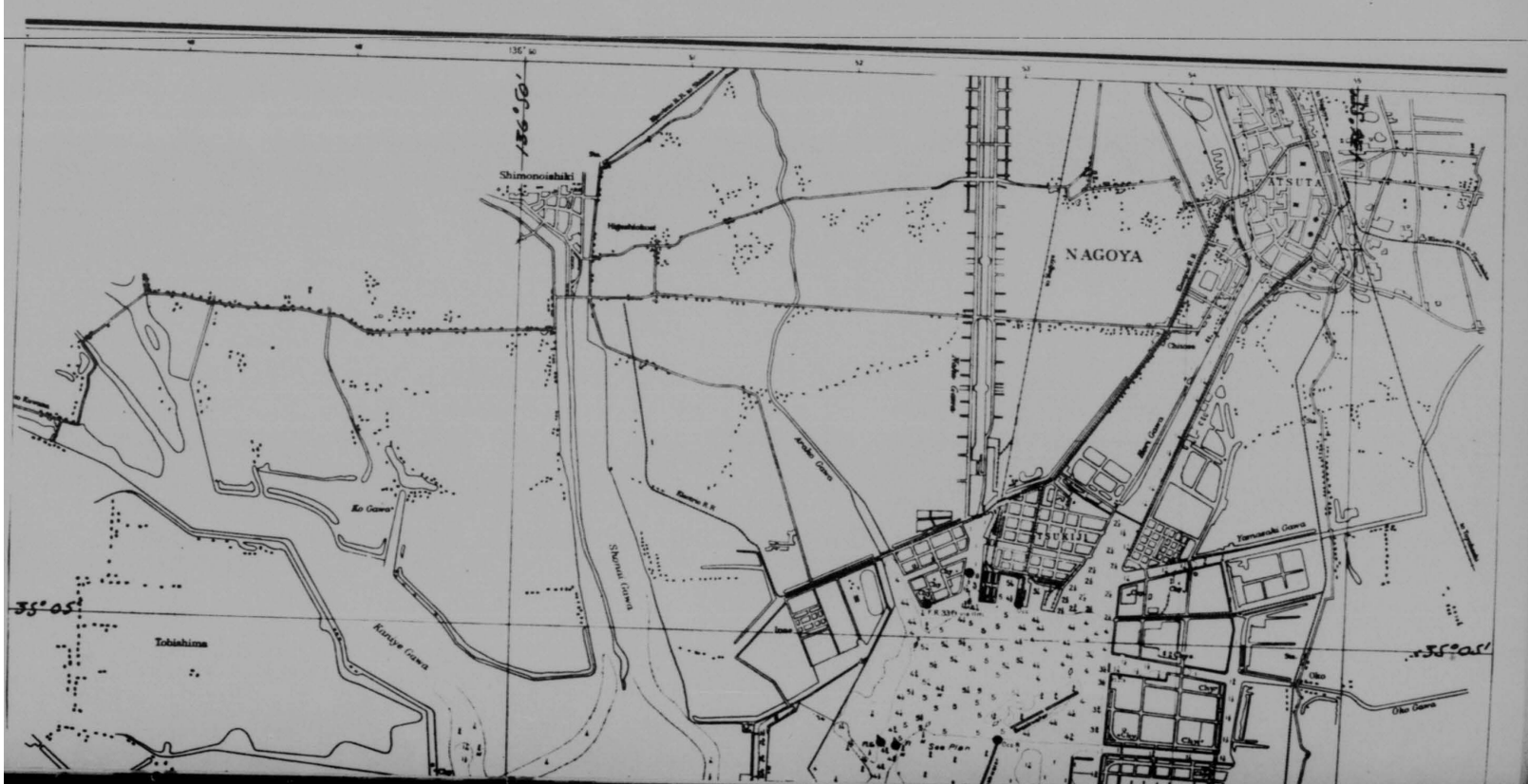
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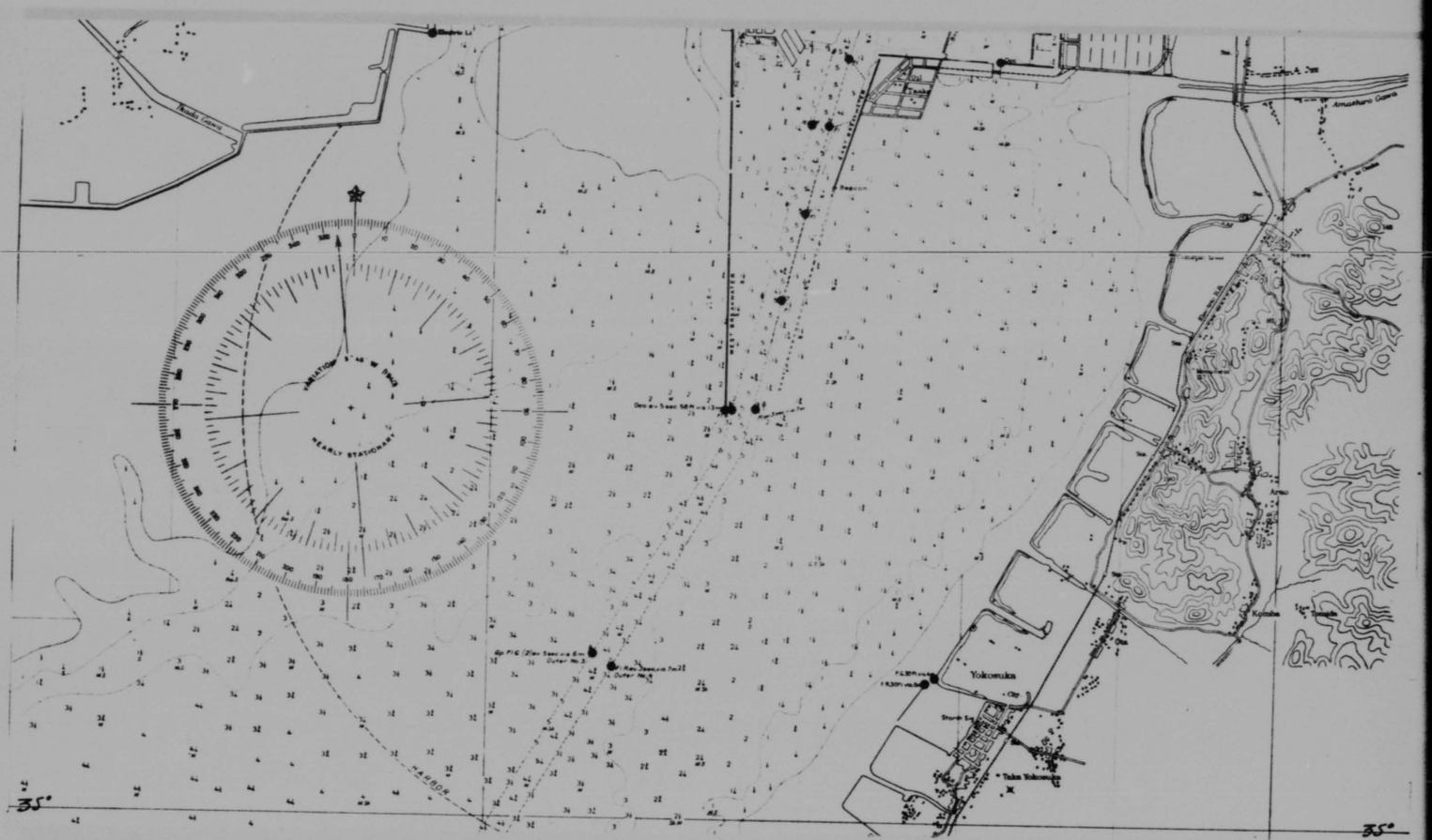


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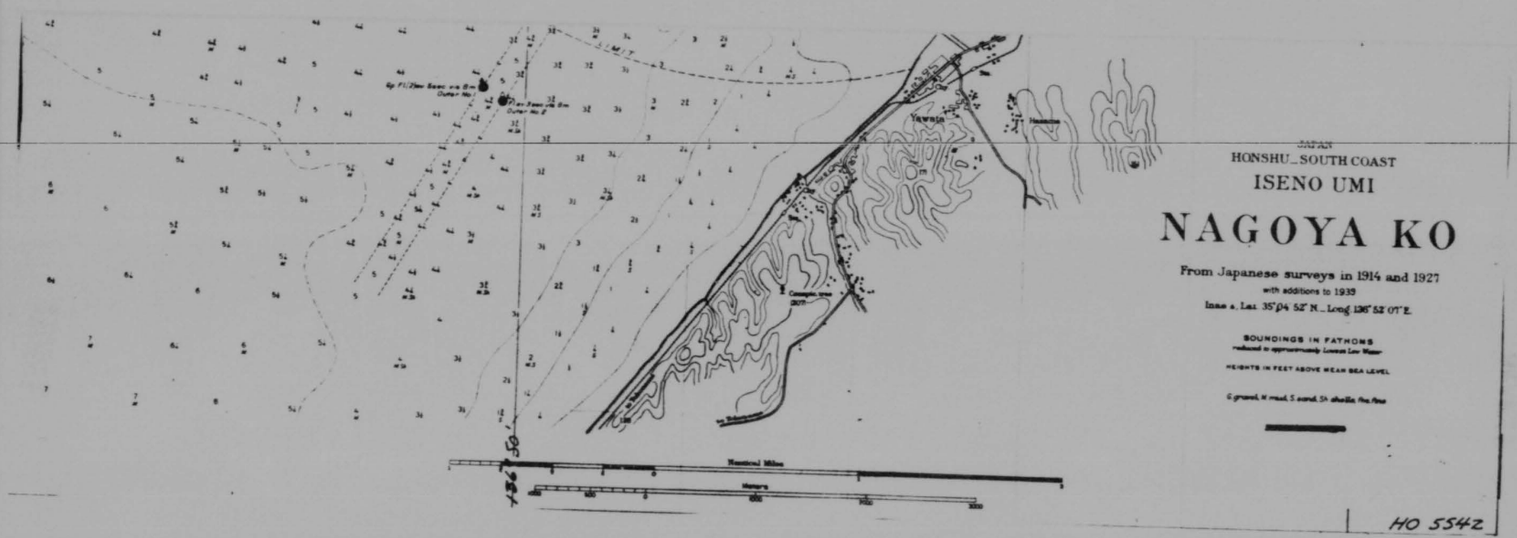


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JAPAN

HONSHU—SOUTH COAST

ISENO UMI

NAGOYA KO

From Japanese surveys in 1914 and 1927
with additions to 1939

Insets. Lat. 35°04' 52" N., Long. 136° 52' 07" E.

SOUNDINGS IN FATHOMS
reduced to approximately Lowest Low Water

HEIGHTS IN FEET ABOVE MEAN SEA LEVEL

G. gravel, M. mud, S. sand, Sh. shells, rks. rocks

HO 5542

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April 1943 SECRET

UNO, PORT FOR OKAYAMA (ALSO TAKAMATSU) 34° 29' N 133° 56' E

(JAPAN PROPER)

Uno, port for the important industrial city of Okayama, is a small harbor, capable of handling all classes of Inland Sea vessels. The facilities include one main pier, which projects southward in the center of the port. Ships can berth alongside and cargo is handled by the pier's machinery.

Small piers on either side accommodate lighters handling cargo from ships anchored in the roadstead, to the east of the main pier.

The Mitsui Tama Shipyard, an important shipbuilding and repairing yard, is located about 1.5 miles SW of Uno.

Uno is the Honshu Island Terminal of the Honshu-Shikoku ferry service. Takamatsu, a small "breakwater" port, is the Shikoku terminus.

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UNO HARBOR
PORT FOR OKAYAMA

Katsura Shima, a. 344 ft.
Lat. 34°28'17"N., Long. 133°57'21"E.

Natural Scale 1:15,000

HIBI KO

Matsuga Bana

Kushiyama Bank

Manaita Ishi

Hokake Iwa

Telegraph Cables

VARIATION 5°20' W (1980)
NEARLY STATIONARY

TIDAL INFORMATION

Place	Lunitidal Intervals		Height above datum of soundings		
	H.W. Mean	L.W. Mean	H.W. Springs	H.W. Neaps	Mean Tide Level
	hrs min	hrs min	feet	feet	feet
Takamatsu Ko	XI 19		7¼	6	4·27
Miyanoura	XI 18		7½	6¼	4·92
Awa Shima	XI 30		10¼	9	6·89

CONVERS FATHOMS

Fathoms	Meters
½	0.9
1	1.8
1½	2.7
2	3.7
2½	4.6
3	5.5
3½	6.4
4	7.3
4½	8.2
5	9.1
5½	10.1
6	11.0
6½	11.4

Nautical Mile
Meters

H.O. 5544

56' 57' 133°58'

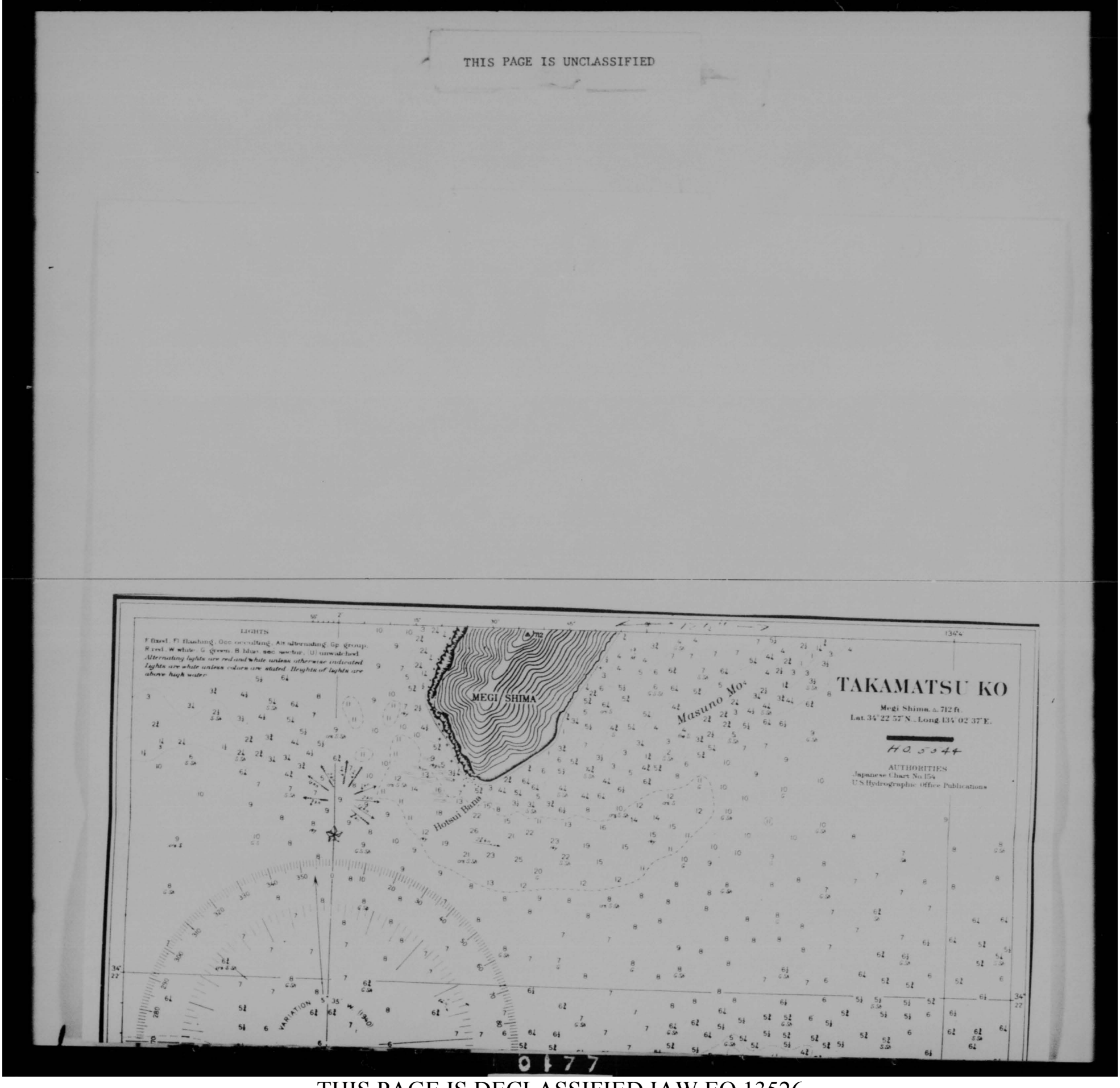
Dimensions between inner neat

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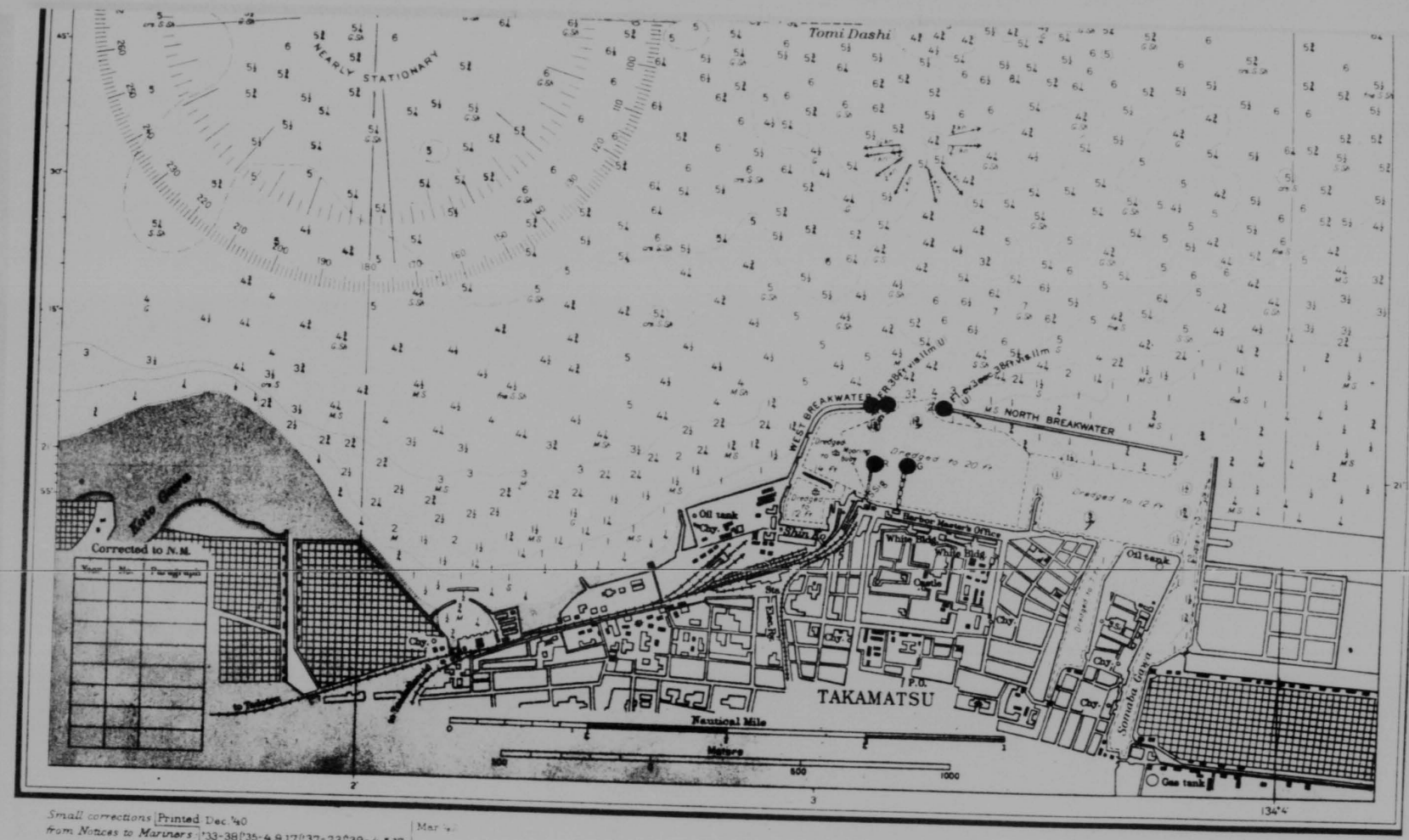
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Small corrections from Notices to Mariners: Printed Dec. '40; '33-38('35-4,8,17('37-23('39-4,5,17 XII '40; Mar. '; III '42

Washington, D.C., under the au

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April 1943 SECRET

OTARU 43° 12' N
(JAPAN PROPER) 141° 01' E

Otaru is important as a coal exporting port, serving as an outlet for the Ishikari Coal Field. It is estimated that about 2,500,000 tons of coal are exported yearly from this port.

Two coaling piers (Targets 392-a&b) equipped with mechanical loaders are located at the northern end of the port. An extensive railroad coal yard extends west from these piers. The coal loaders have a combined capacity of 11,000 tons per day. The destruction of these loaders would curtail severely the export of coal since it is not believed that adequate labor is available to load coal by bucket.

Ships waiting to load coal will be found anchored just south of the two piers, within the shelter of the outer breakwaters.

Other ships will be found at the southern end of the harbor, where a general cargo wharf is available.

Hills rise to 1,000 feet just to the NW, W and SW.

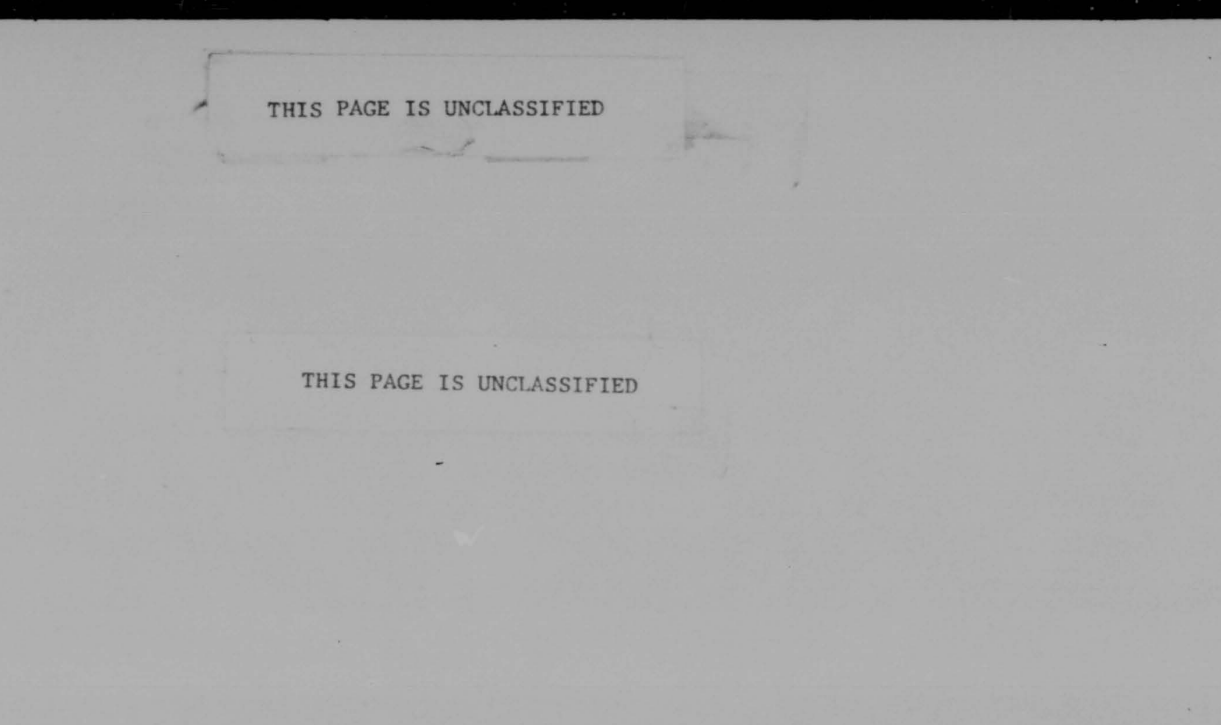
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General view of the Port of Otaru, an important export port of Hokkaido.

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April 1943

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SHIMONOSEKI STRAIT 33° 58' N
130° 54' E

INCLUDING THE PORTS OF
YAHATA-YAWATA-TOBATA-KOKURA-MOJI-SHIMONOSEKI

(JAPAN PROPER)

The Shimonoseki Strait, the westernmost entrance to the Inland Sea, is Japan's most important waterway. It is believed that the largest ship concentrations to be found east and in the Far East can be expected in the Strait. It has been estimated that over 100 ocean-going vessels will be found in the Strait at any given time. These concentrations are the result of: (1) the great concentration of industry in the Yawata Area (iron and steel, non-ferrous metals and chemicals) the raw materials for which require a vast tonnage of shipping; (2) the yearly export of over 10 million tons of coal from the ports of Wakamatsu and Moji and (3) the open port of Moji which is a focal point of Japanese imports from China and Korea, and an important military port.

The Shimonoseki Strait is an "S"-shaped channel, fringed by steep hills which rise to about 1700 feet to the north and SE.

The Strait has long been a fortified zone and it is believed that strong AA defenses are available.

1. Shimonoseki Harbor -- The Government Railways Wharf (Target 42) is the only wharf which can accomodate sea-going vessels. This wharf, used by the ferries to Fusan (Chosen) is of concrete construction and is equipped with heavy mechanical loading facilities and a railroad freight station. Additional wharves are available to the east of the Railways Wharf. These are connected with storehouses, but they can handle only small, Inland Sea vessels.

Ship repair dockyards and fueling facilities are available along the eastern shore of Hiko Island, just south of Shimonoseki.

2. Moji -- The large port of Moji is the only port in this Strait which can accomodate very large ocean-going vessels. There are two wharves in Moji Proper and several in the industrial suburbs to the south. The Moji Central Wharf (Target 44a), accomodates only medium-sized vessels, many of which anchor in the roadstead and lighter cargo. The Moji Southern Wharf (Target 44b) is about 1 mile long and equipped with heavy mechanical loading facilities. Just west of this wharf is the anchorage space for the largest ocean-going vessels as well as military shipping which assembles for convoying. An extensive coaling station occupies the southern half of this wharf. All types of general cargo, including military supplies, are handled at Moji. Although Wakamatsu and Yawata handle the bulk of the coking coal and iron ore for Yawata's steel industry, very large vessels (i.e., large ships from the ST Pacific) unload ore and similar cargo at Moji for trans-shipment by rail to the Yawata area. The Industrial Suburbs wharves to the south of Moji can handle only very small vessels and junks.

3. Kokura -- Kokura is a secondary port, used by small vessels unloading iron ore and coking coal for the city's steel industry. There are three separate anchorages alongside the concrete surfaced wharves of reclaimed land.

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SHIMONOSEKI STRAIT

(JAPAN PROPER)
Cont'd

4. Nakamatsu-Yawata: - - The ports of Nakamatsu and Yawata consist of narrow inlets and basins artificially formed by reclaimed land. This land has been "mad" in a natural bay much larger than it now appears on the harbor chart.

Within these small harbors ships are berthed broadside under various types of mechanical loading equipment for handling iron ore, coal, pig iron, etc. If steel production is being maintained at anything like capacity, coal and ore shipments alone will account for such a congestion of shipping that any vessels within the berthing areas, even with reasonable warning, could not make open water in the event of air attack.

Steel mills and other industrial plants lie near shipside; a network of RR spurs extends to shipside and under loading devices. Where ships are not discharged by mechanical devices, basket labor (as for coal) and stevedores in large number are required.

The majority of the vessels found at Nakamatsu and Yawata wharves will be 2000/3000 ton vessels from the coal and ore areas of the mainland north of the Yangtze. These vessels are coal burners and arrive in sufficient number to be conspicuous on the sea lanes between the Shimonoseki Strait and the mainland. In addition to the vessels loading and discharging at the wharves, many others will be moored at buoys in the basins, lightering cargo.

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LOOKING NE

MOJI



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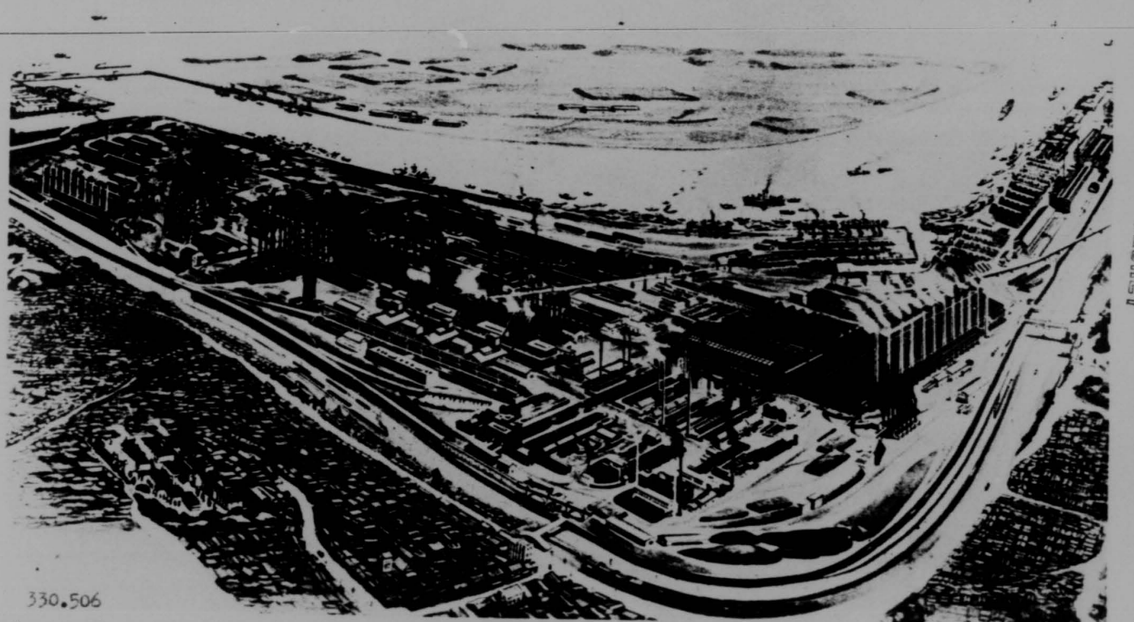
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330.506
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(Heart of) Yawata Steel Plant - Yawata, Japan

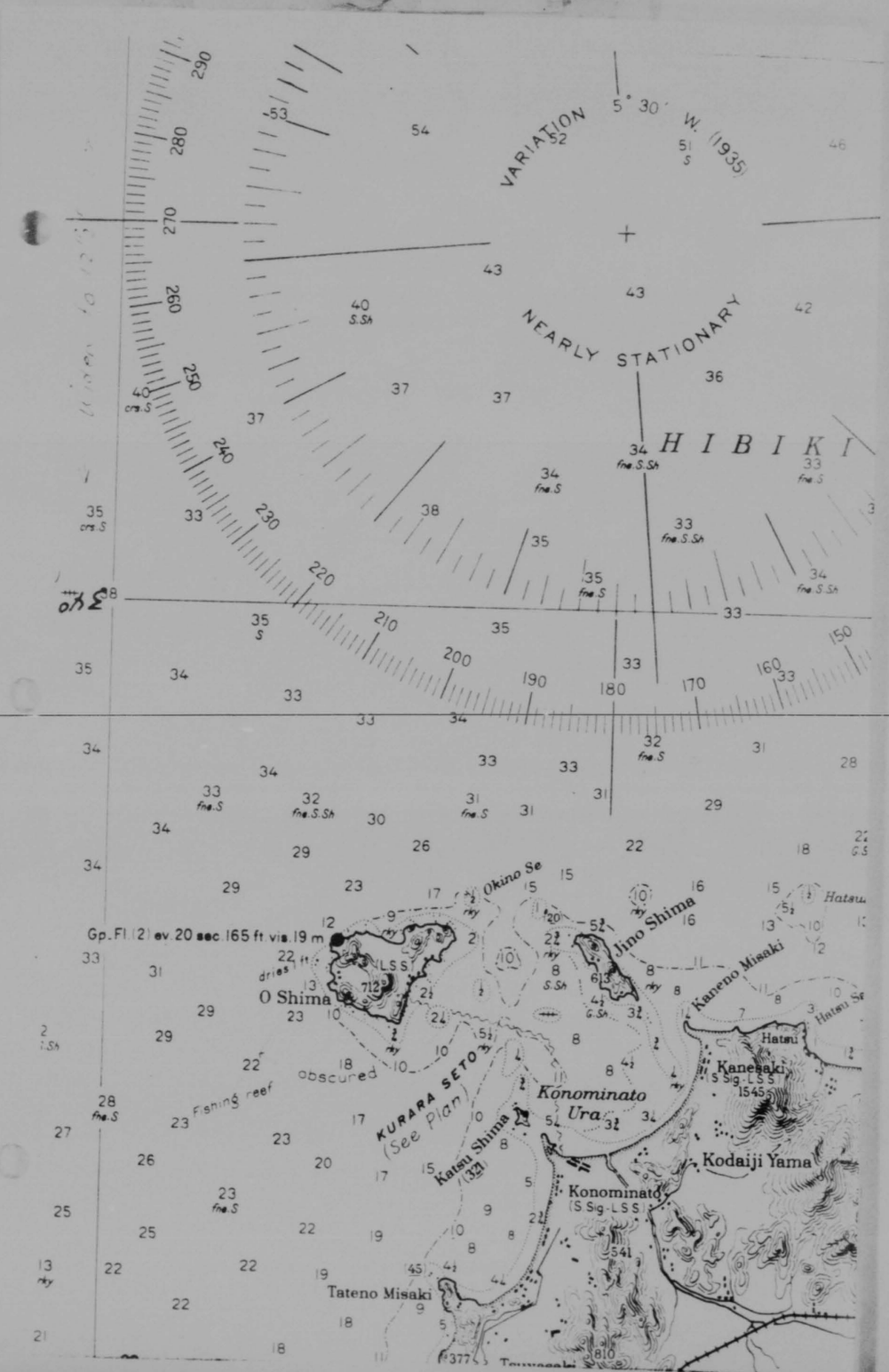
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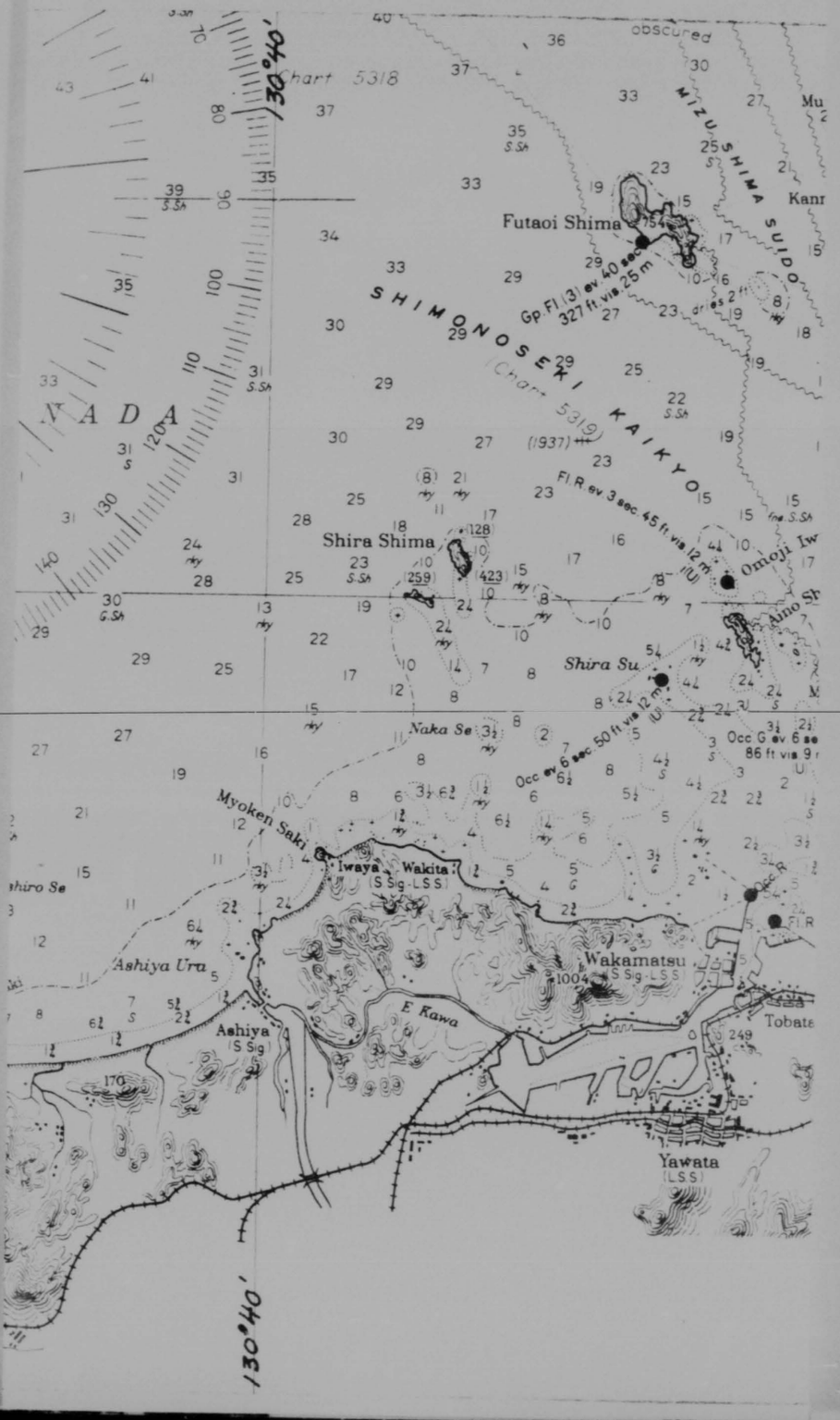
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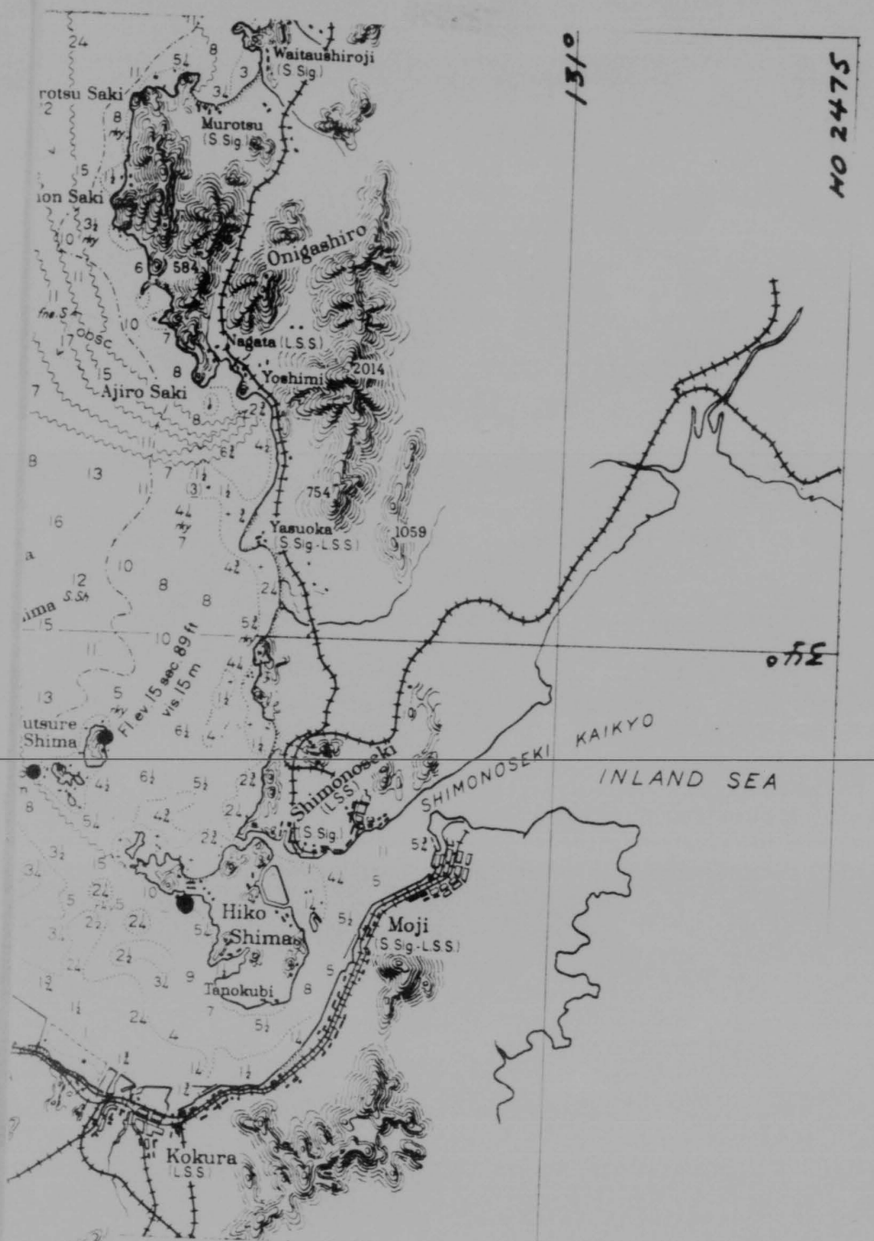
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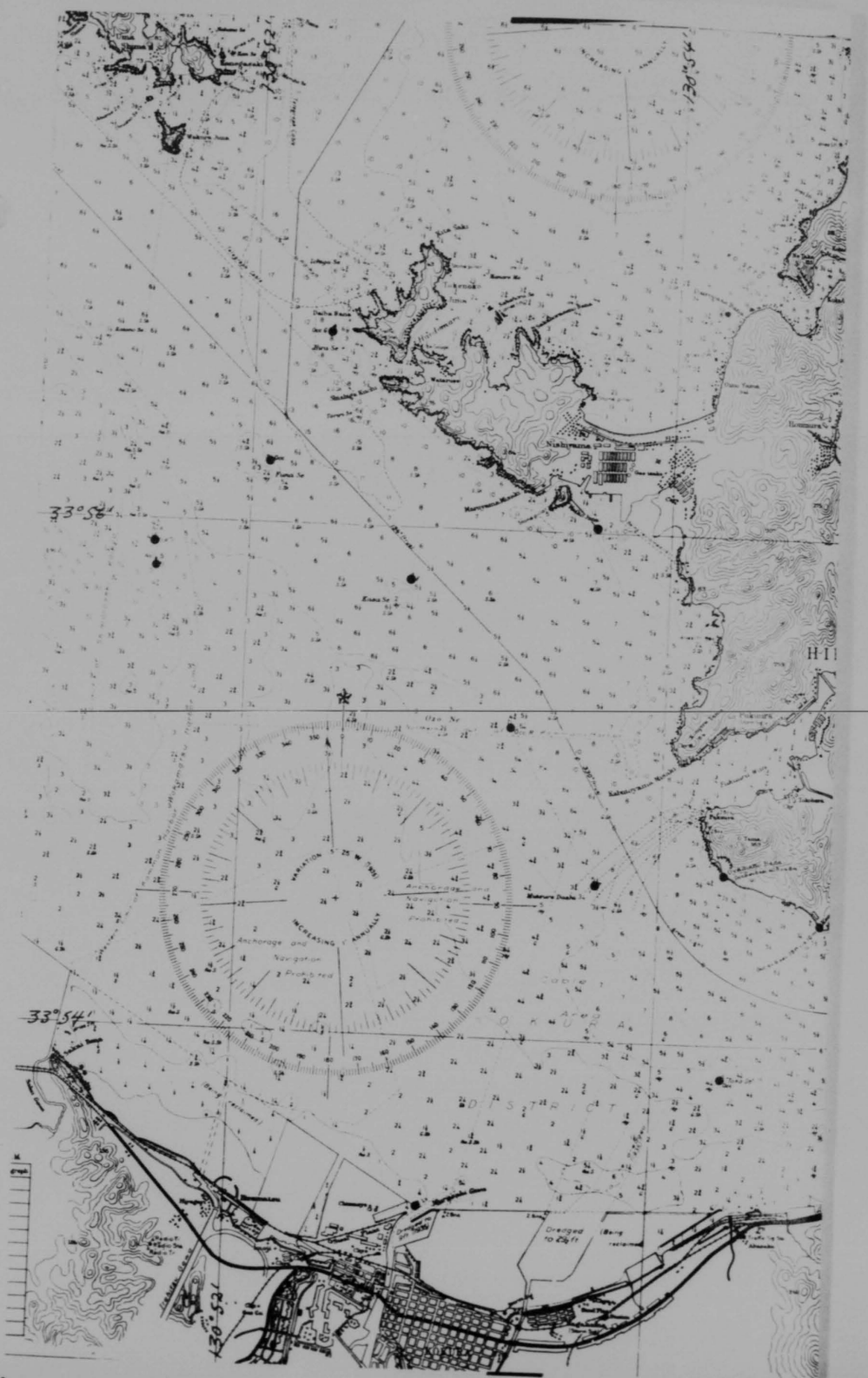
including
Shimonoseki, Moij, Kokura,
Yawata and
Shimonoseki Strait

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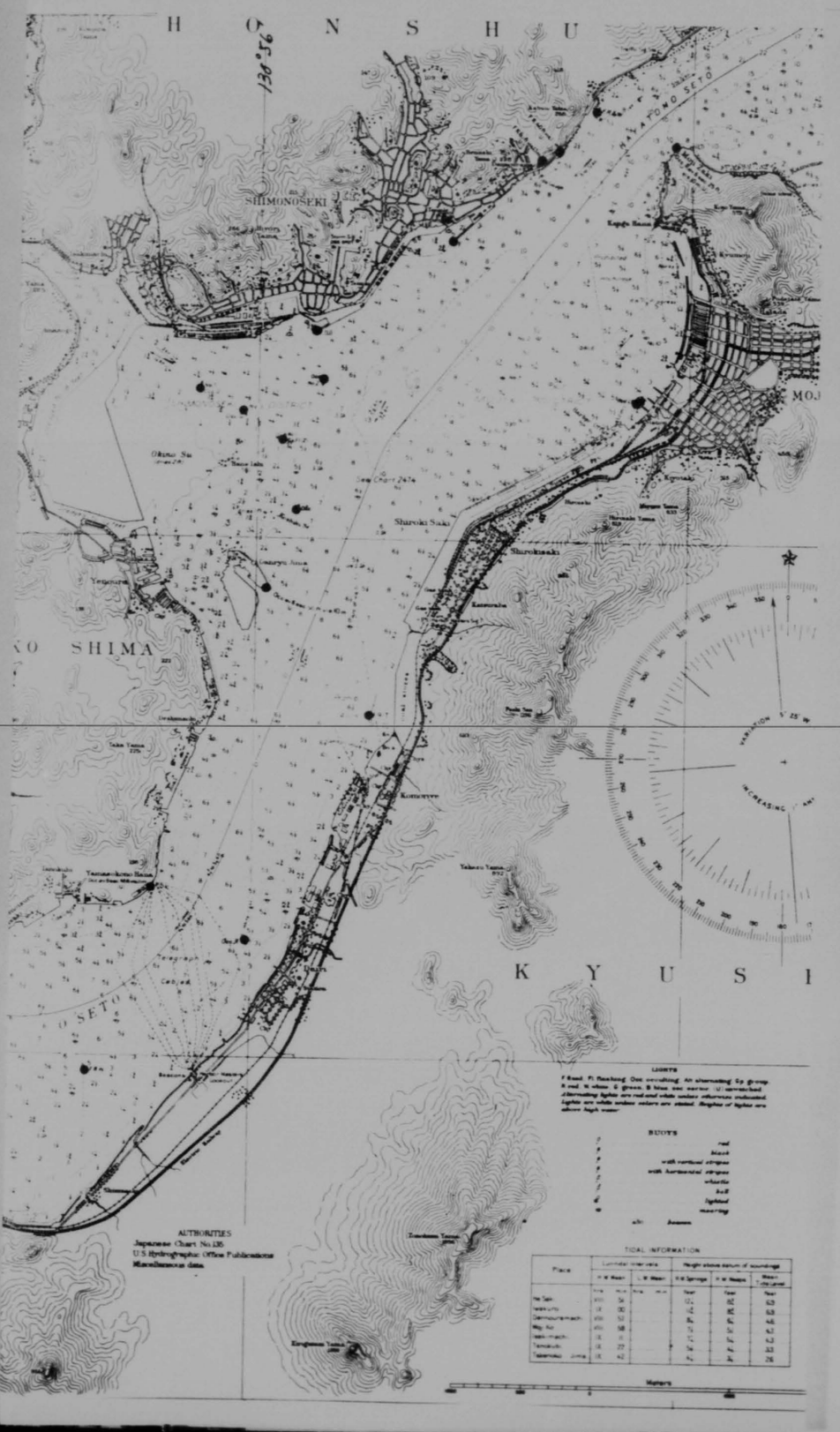
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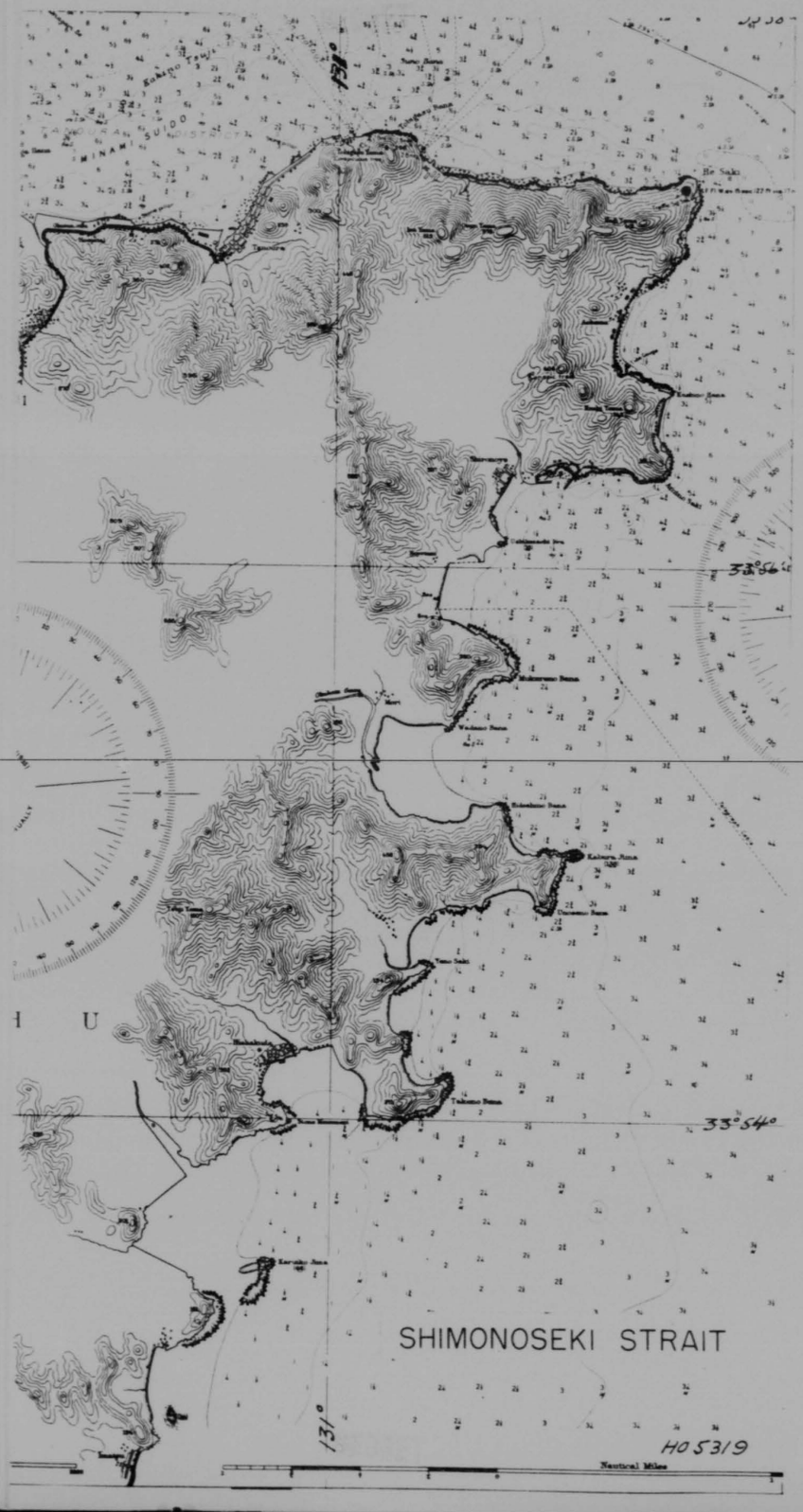


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SECRET

April 1943

TOKYO-YOKOHAMA
(JAPAN PROPER) 35° 30' N
139° 40' E

These two ports lie on the NW shore of the bay. They constitute two relatively small groups of berthing facilities; Tokyo, including Shinagawa, and Yokohama, including Kawasaki.

The bay, which is deep in the center, shoals rapidly to extensive flats off the city areas where there is less than 6 feet of natural depth. From these flats, land has been reclaimed, and channels to deep water dredged.

This "made land" against which vessels lie, is covered with structures of every character, from transit freight sheds and more permanent warehouses, to industrial plants of great size and importance.

In normal times, the berthing facilities could not accommodate the volume of traffic and extensive lightering was resorted to. This harbor area previous to the war was one of the most congested harbors in Japan. Moreover, many of the vessels were foreign, or Japanese ships engaged in foreign trade other than the Asiatic mainland. Since the war, because of the increasing shipping shortages and the consequent shift to rail and curtailment of non-essential traffic, fewer ships can be expected in these harbors. Industrial coal must move, and heavy industry will require more shipping, but some of the peace-time factors which accounted for some shipping of the larger tonnage classes are no longer present.

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YOKOHAMA

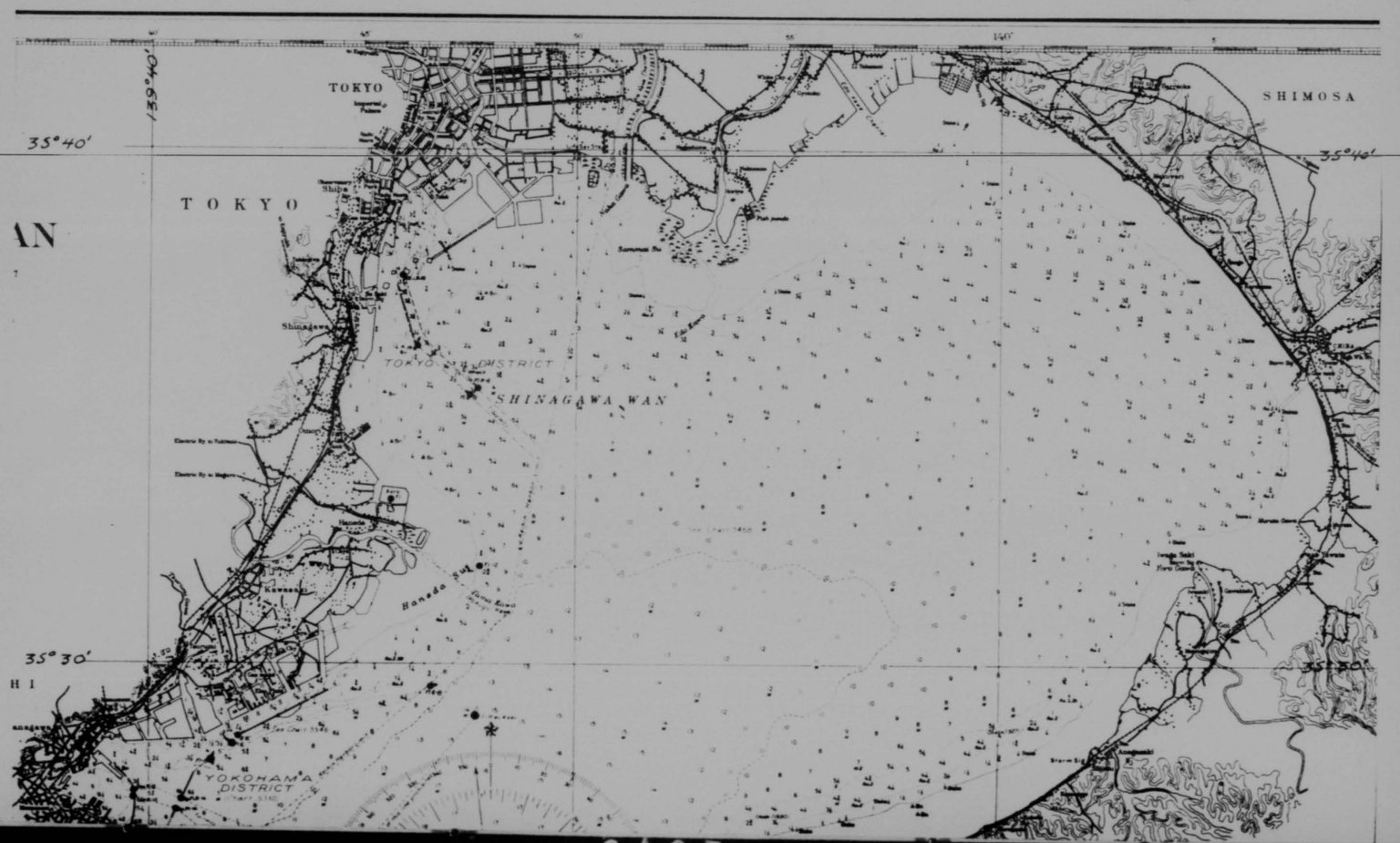
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SAFETY FILM KODAK

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April 1943 SECRET

UBE 33° 57' N
131° 12' E
(JAPAN PACIFIC)

Ube is an important coal bunkering port for Inland Sea vessels. It is a "breakwater" port with two very narrow entrances, only the westernmost of which can be used by sizable ships.

Coal from the Okinoyama Collieries, located at the water's edge, is the principal export. Some chemicals and cement are also exported from Ube.

The port has long served as a coaling station for naval auxiliaries, and naval ships of this type can be expected in port.

Some vessels may be moored just west of the western entrance to the port. Other vessels will be found near Onoda (about 4 miles to the N.), loading cement from the very large cement mill there.

A naval oil-fueling depot is located at Tokuyama, about 30 miles east of Ube. Oil tankers and all classes of naval vessels may be expected there.

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UBE
HARBOR

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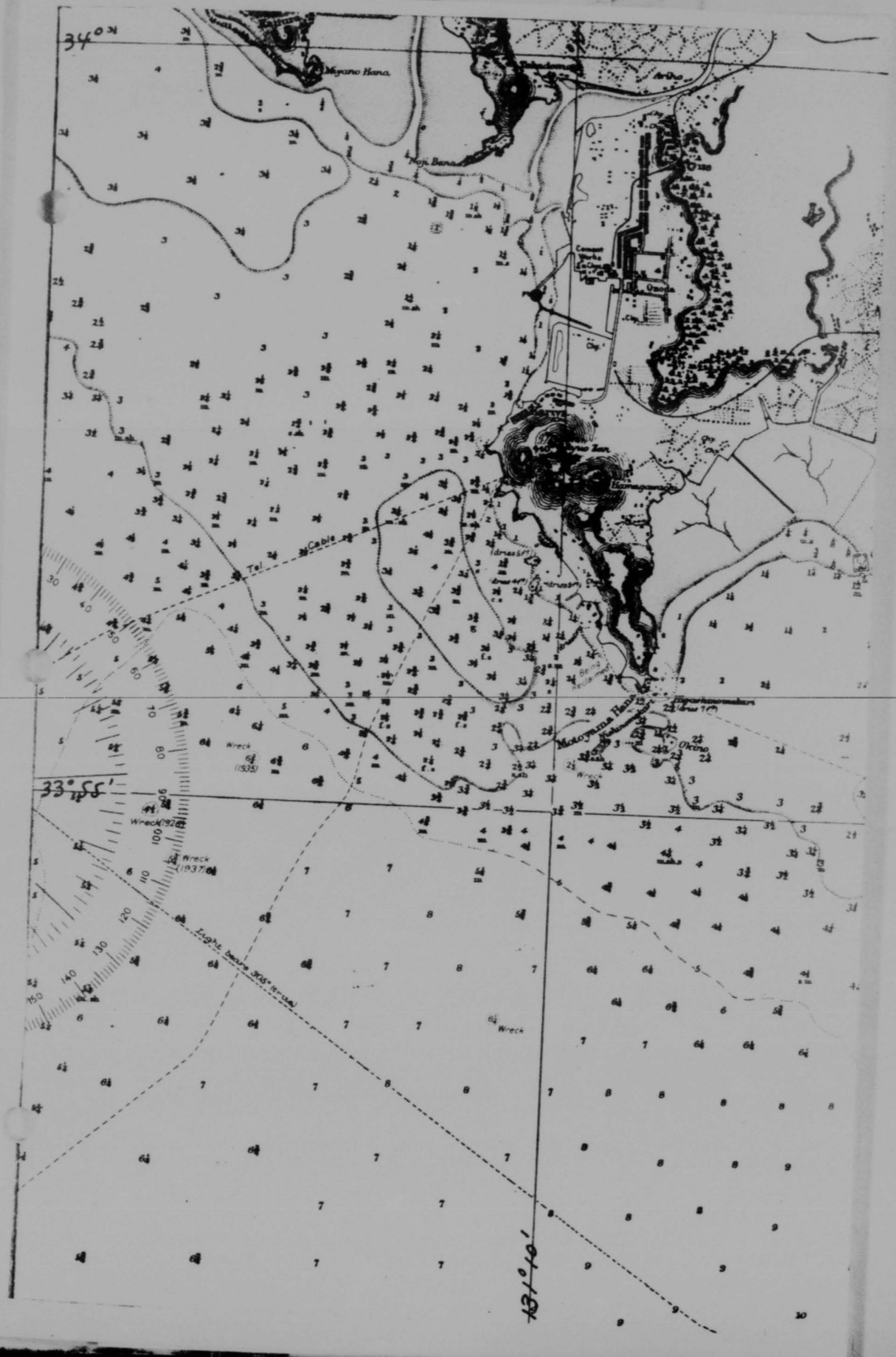
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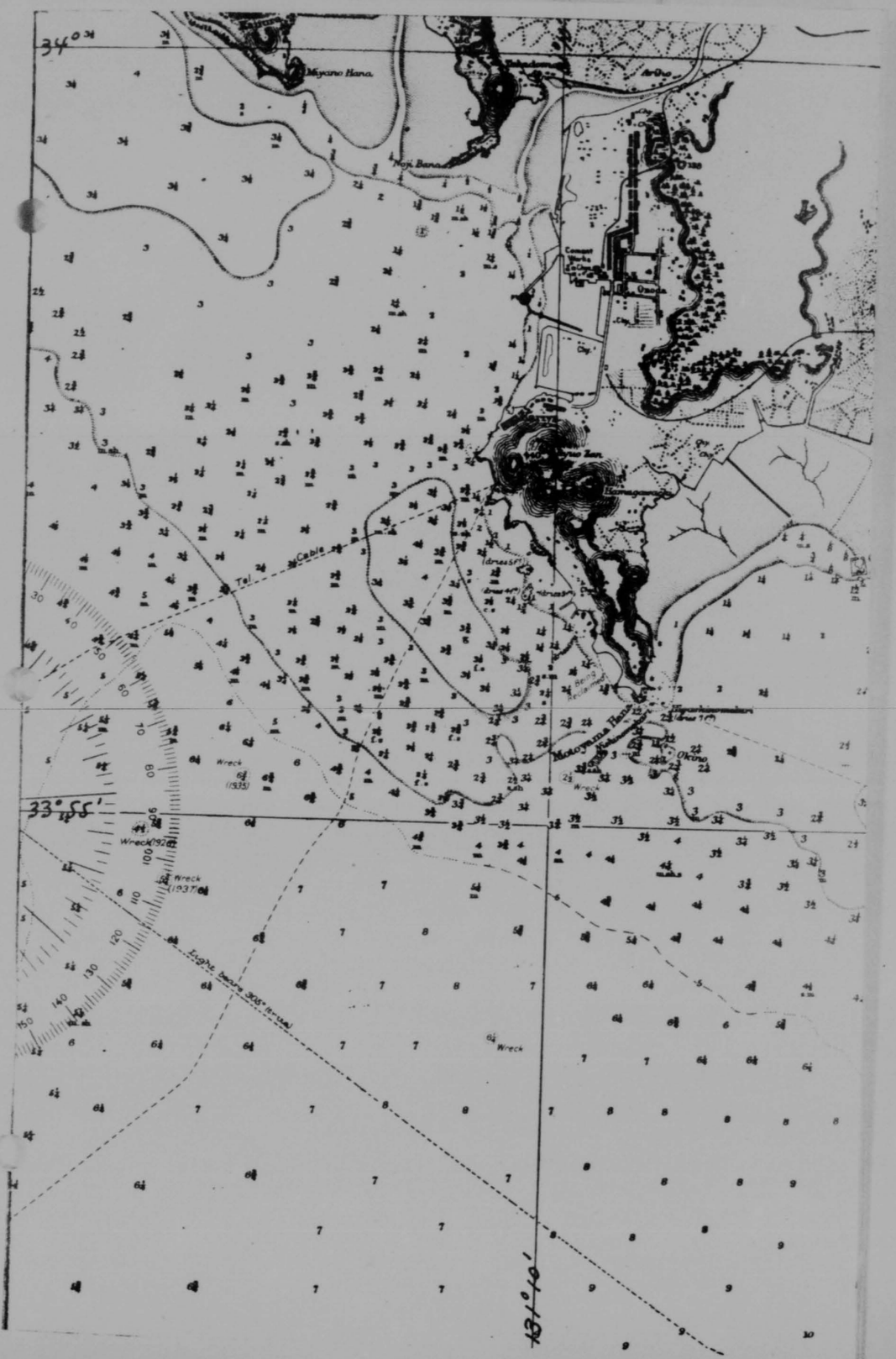
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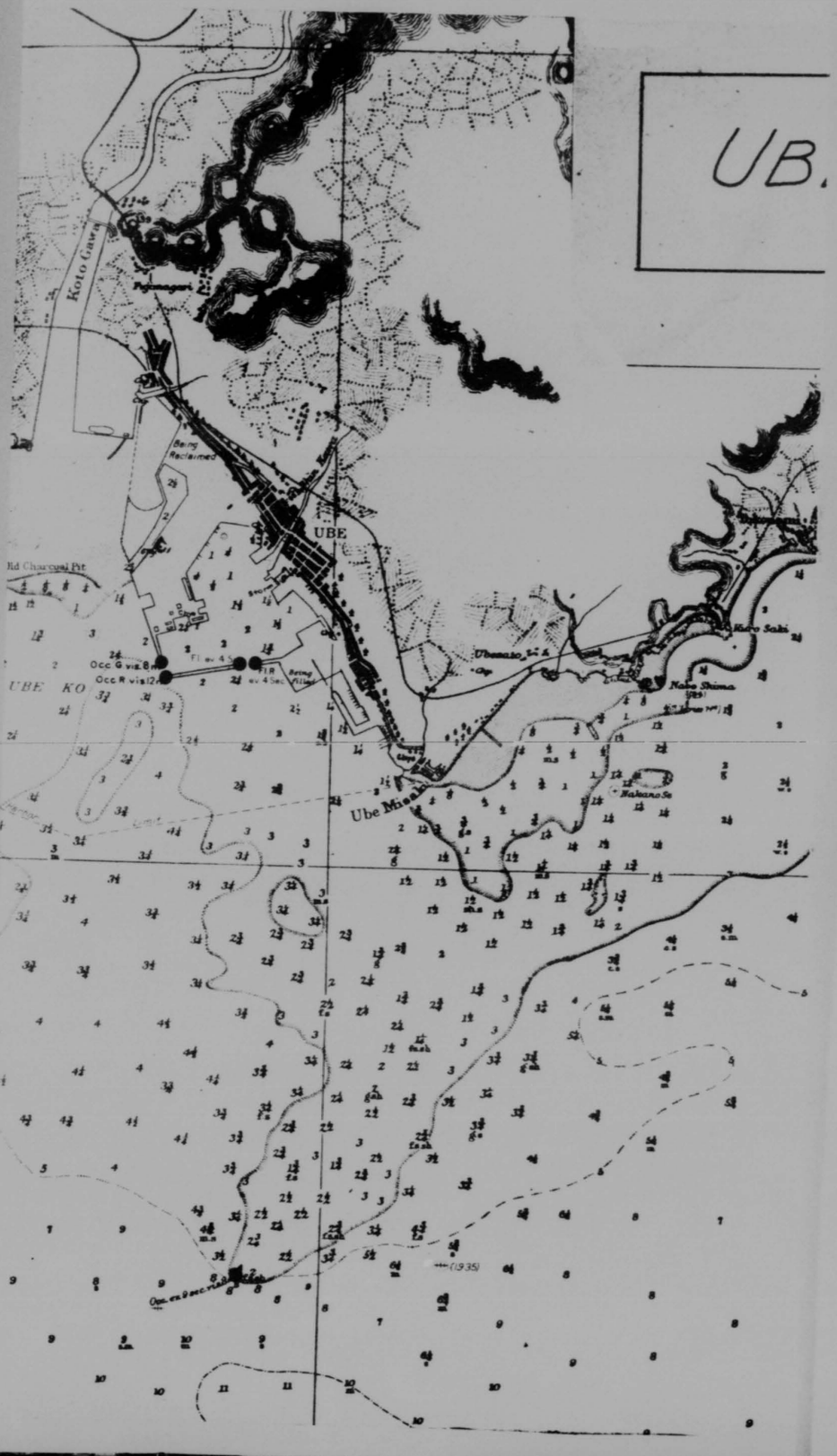
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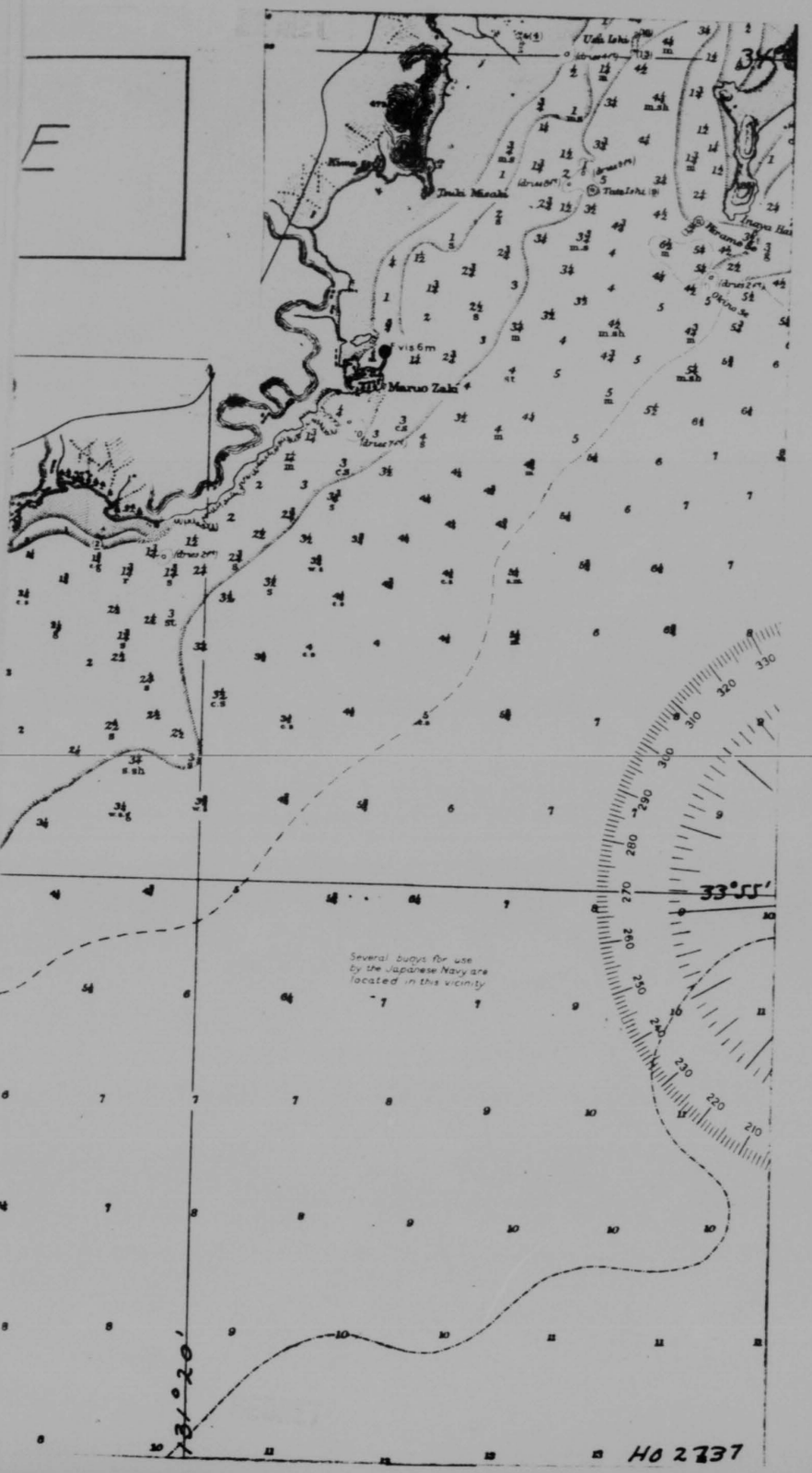


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April 1943

SECRET

YOKKAICHI

(JAPAN PROPER)

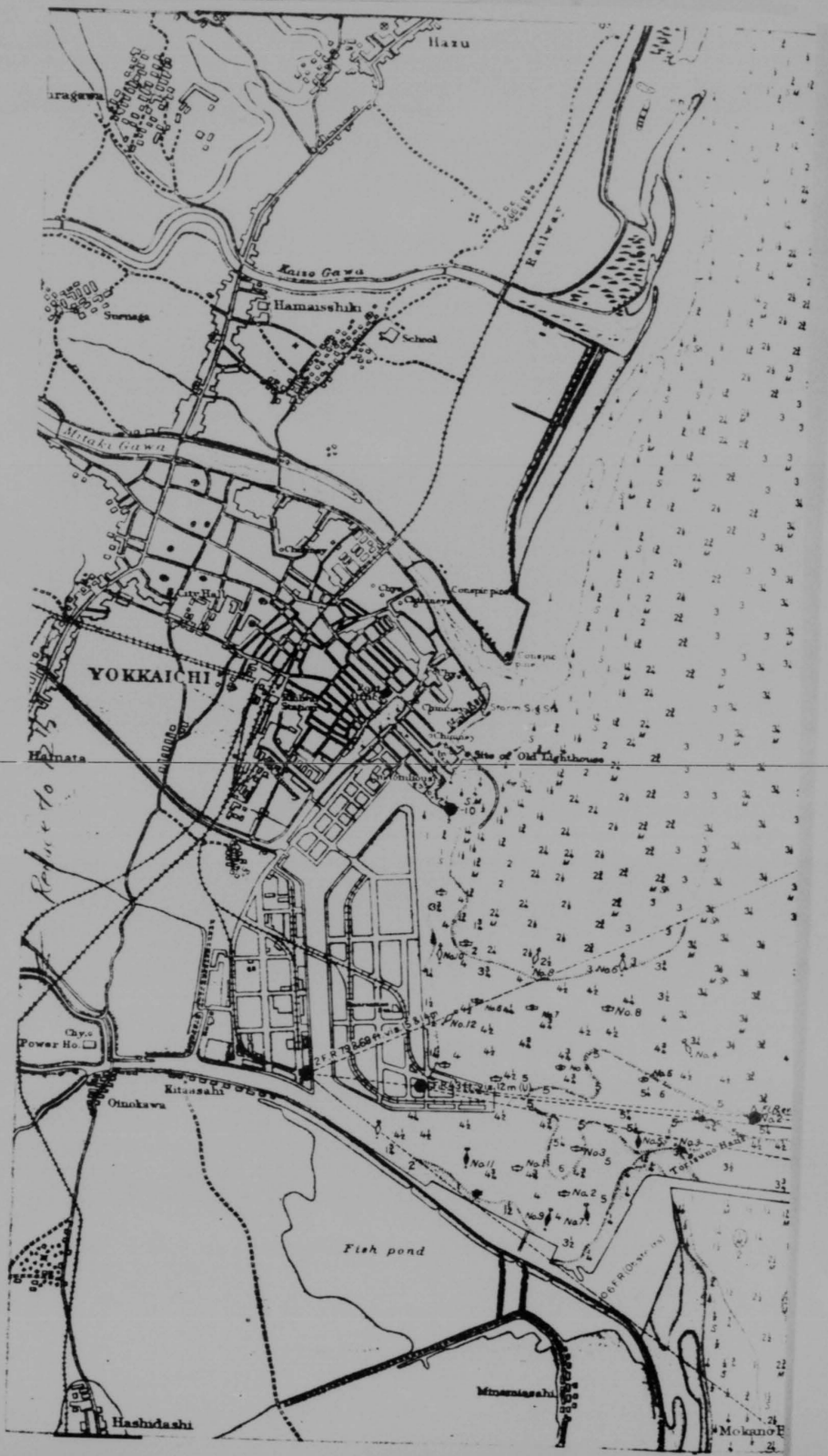
57° 00' N
136° 39' E

Yokkaichi is an auxiliary port for the Nagoya Area and a minor naval station. Small ships can berth alongside a large wharf in the southern part of the city where RR spurs and storehouses are located. Most ships, however, anchor in the open roadstead and lighter cargo. A naval anchorage is located just south of the wharf. A naval station, operating in conjunction with the adjoining Suzuka Naval Air Station, is located here. Very small trawlers and junks moor in a large basin (enclosed by breakwaters) north of the main wharf.

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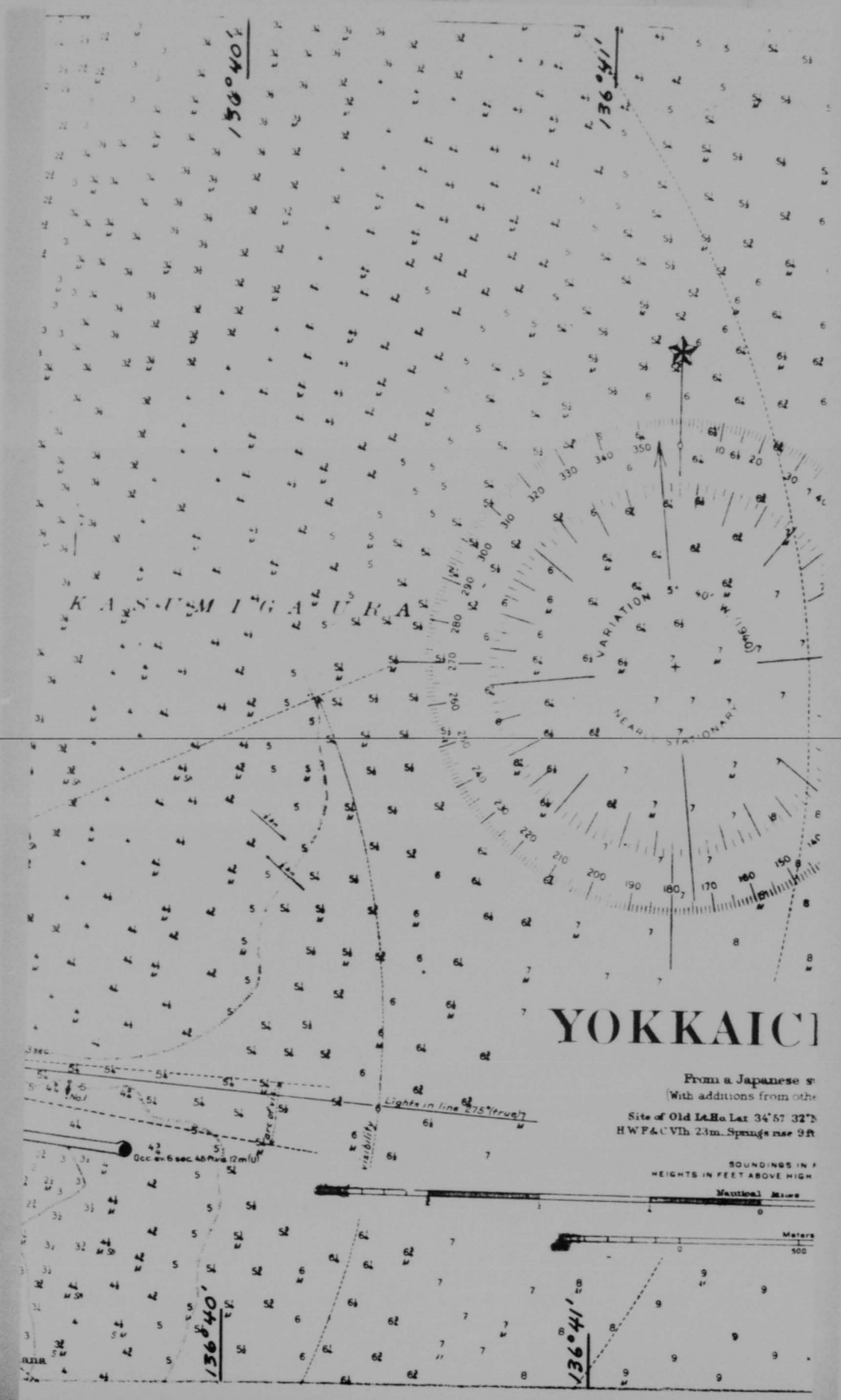


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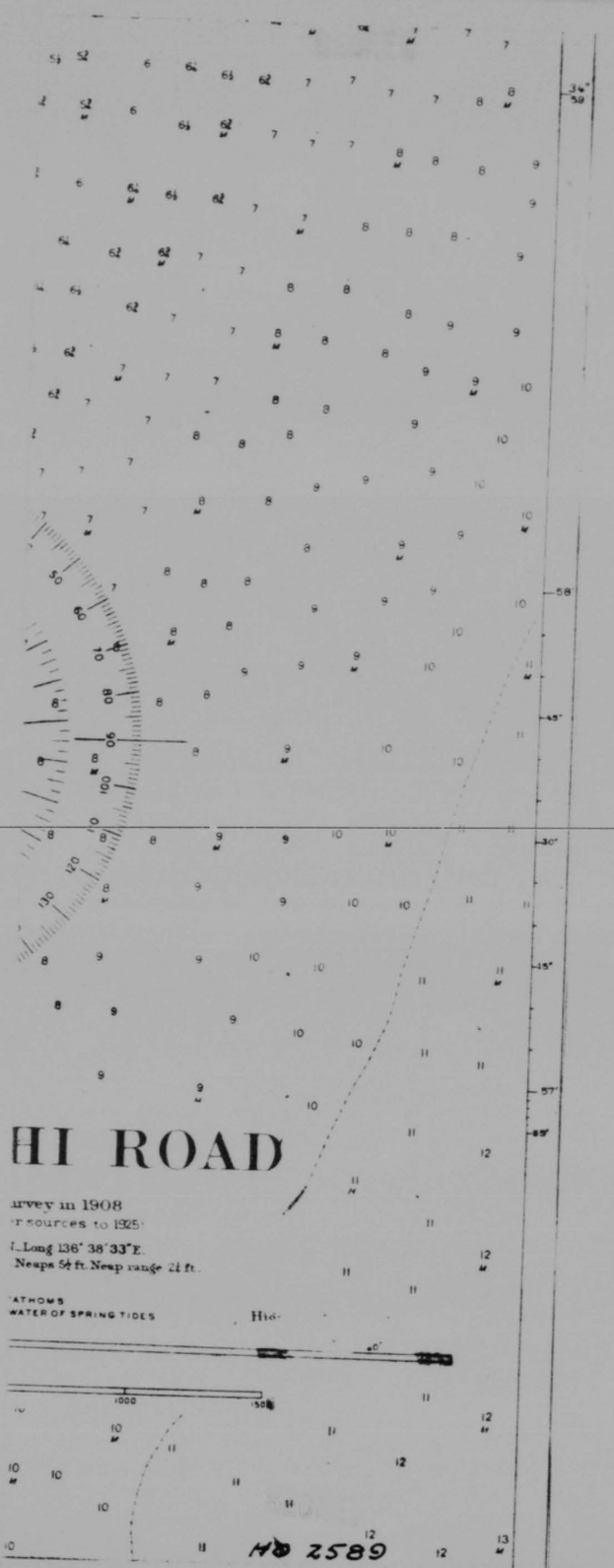
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April 1943

BANGKOK (BURMA) 13° 42' N 100° 35' E

The bar at the mouth of the Chao Phraya River does not permit the use of Bangkok Harbor by vessels drawing more than 12 to 15 ft of water. Vessels of deeper draft discharge at Si Chang Island (13° 09' N, 100° 49' E), some 30 miles SE of the river mouth. Transhipped cargo is brought to Bangkok on light draft vessels and lighters.

The New Government Port area (Target 28) comprises a concrete wharf and 6 large ferro-concrete warehouses. The operation of this unit would reduce the importance of the wharves in the heart of the city.

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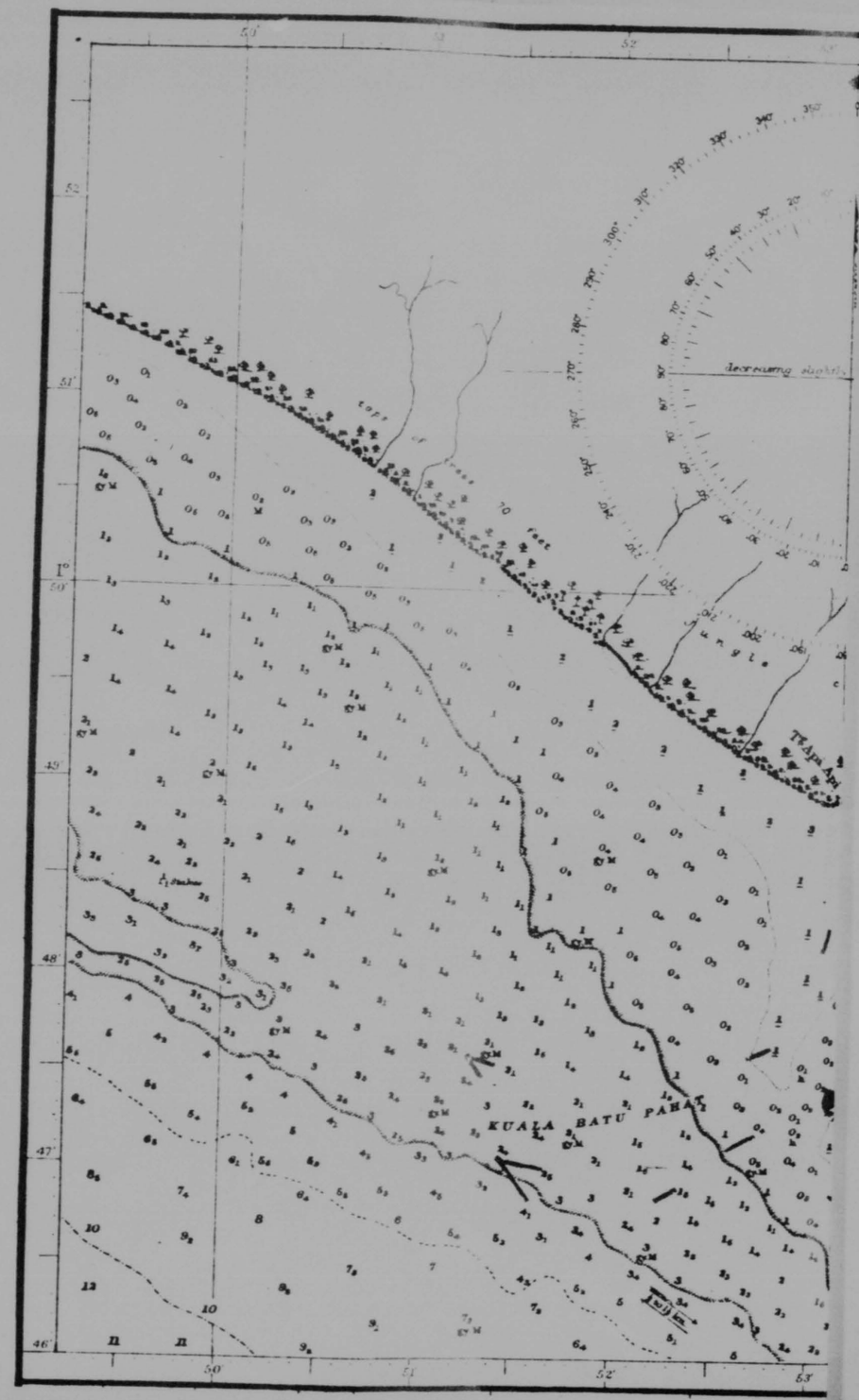
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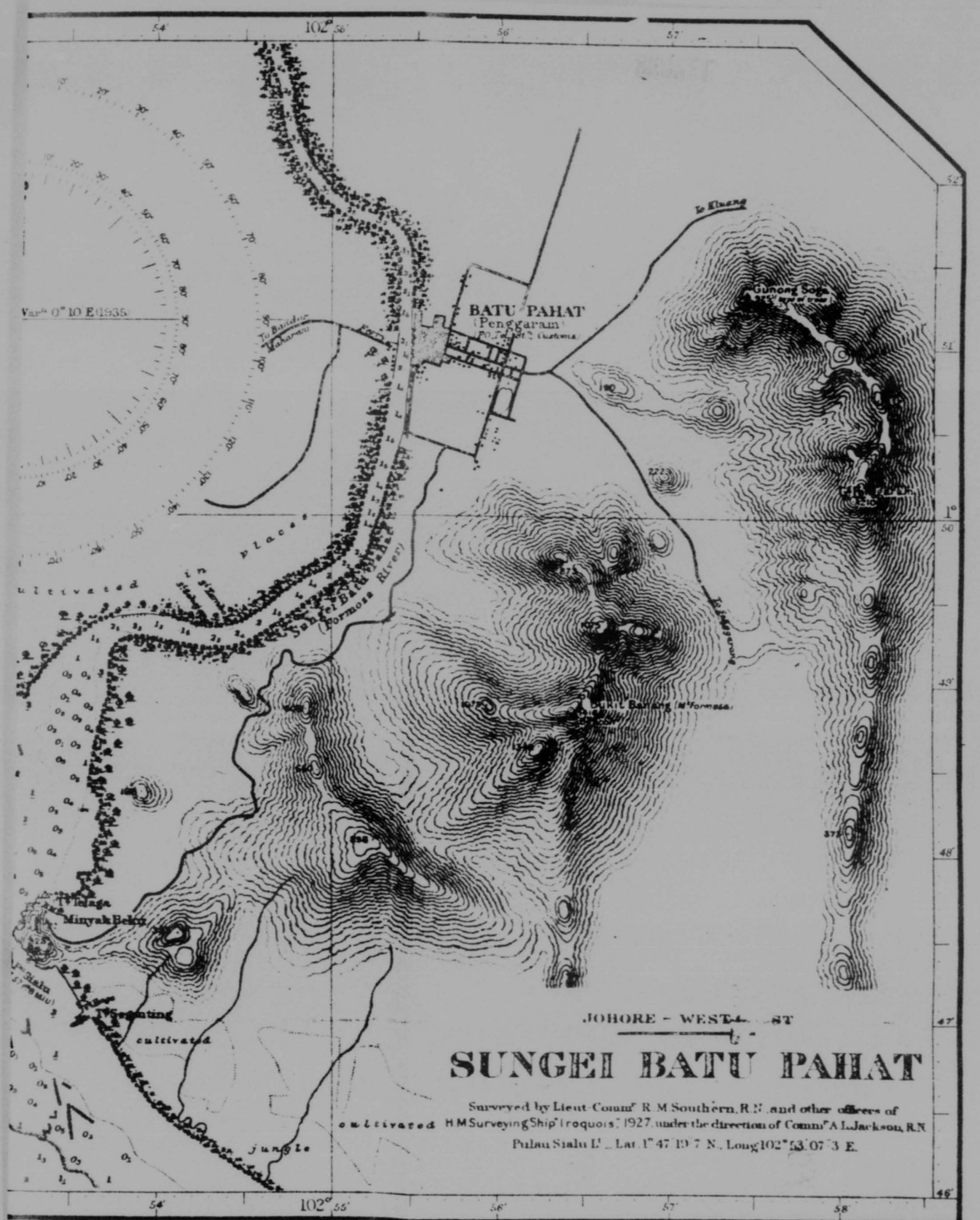
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April 1943 SECRET 04° 47' N
103° 27' E

KUALA DUNGUN
(MALAYA)

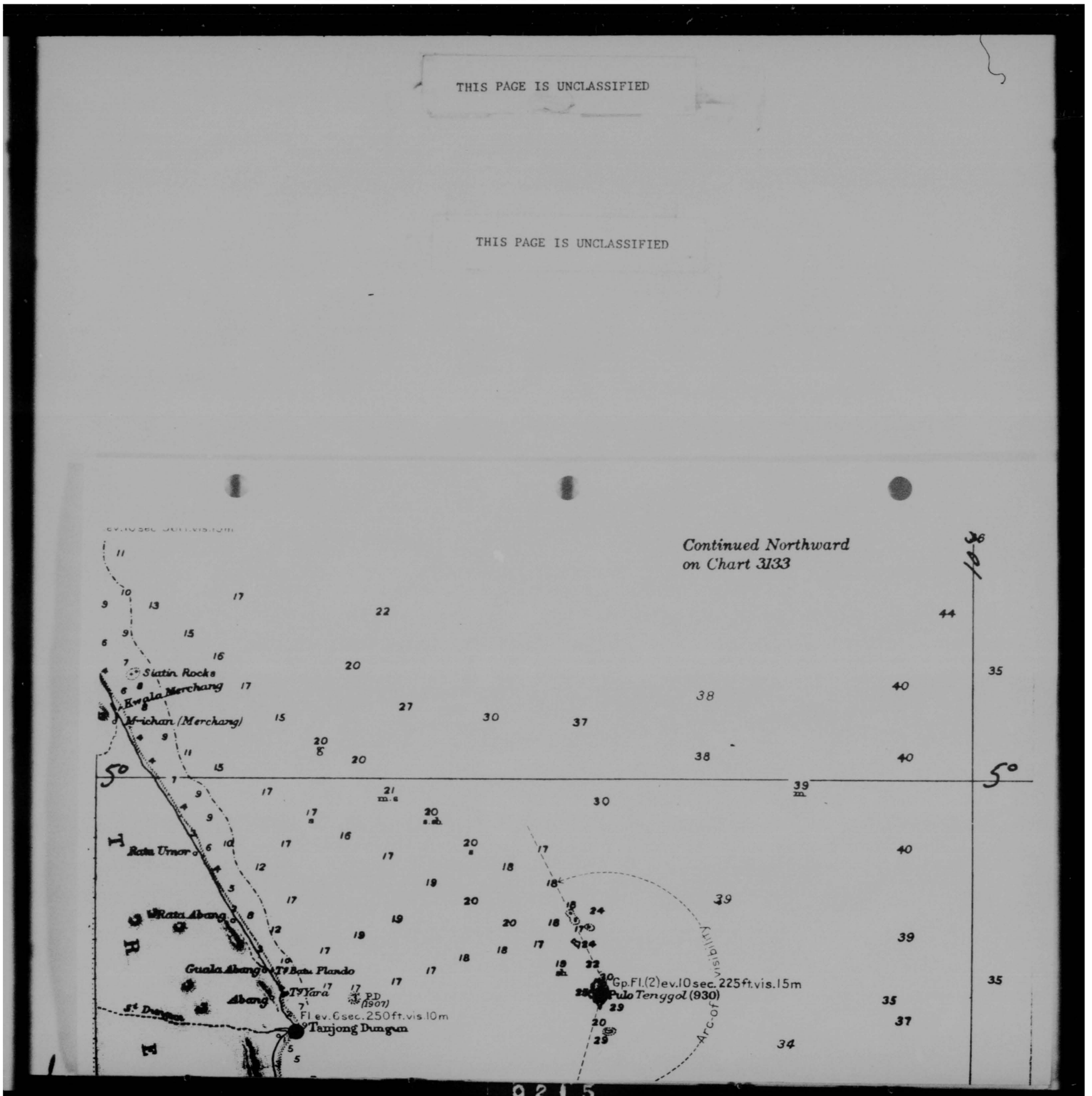
Kuala Dungun possesses no harbor facilities worth mentioning and derives its importance from the fact that it is the outlet for as much as 1,000,000 tons of high-grade iron ore annually. The ore is brought by a light railway to a wharf situated on the shallow Dungun River about 2 miles from the sea. Lighters carry the ore from this wharf to vessels anchored in the roadstead. This procedure is possible only during the SW monsoon (April through October); during the NE monsoon (November through March) heavy seas prevent loading vessels by this method and no iron ore can be shipped from Kuala Dungun.

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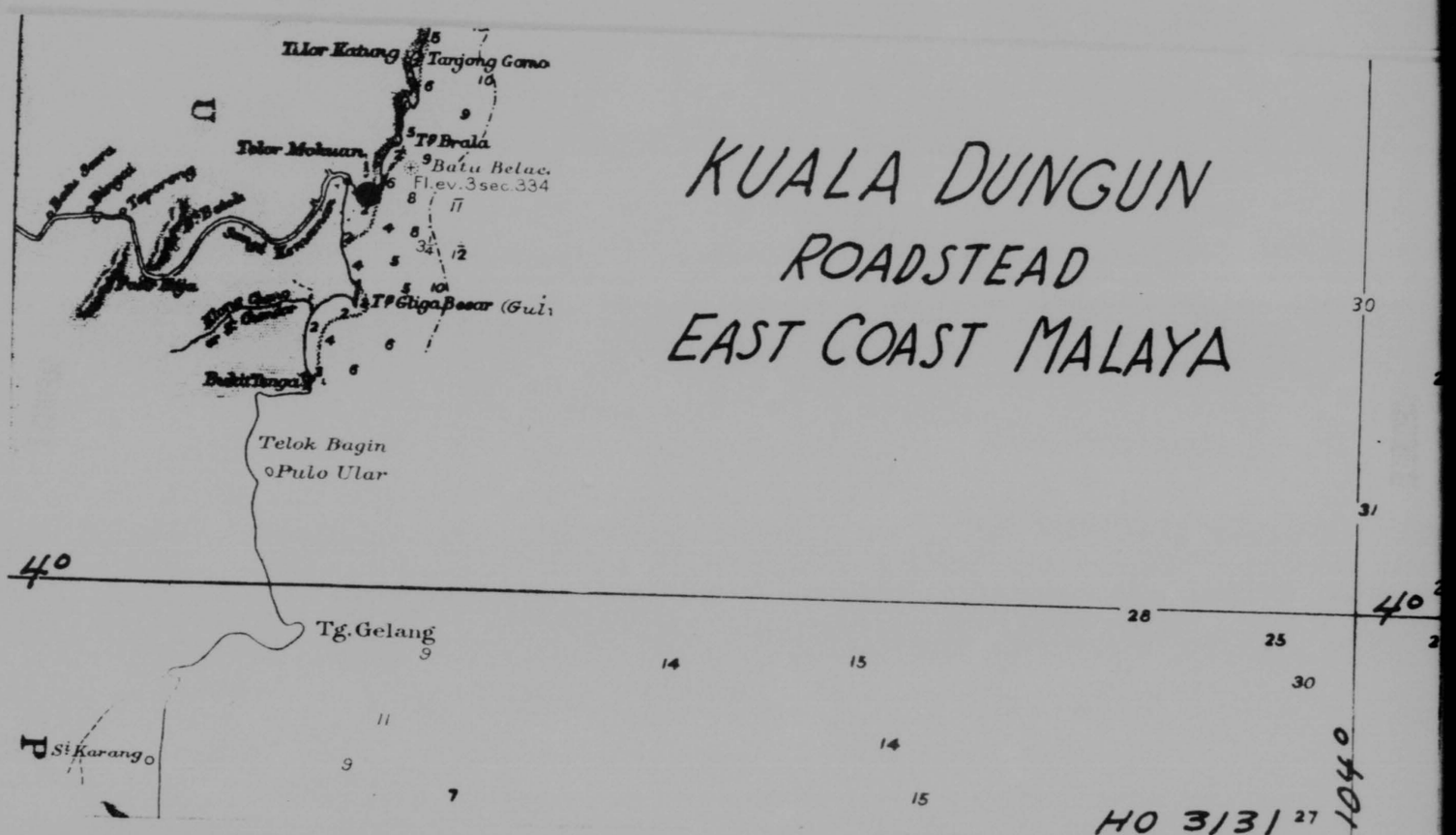


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SECRET

April 1943

PENANG (MALAYA) 05° 25' N 100° 21' E

Penang is Malaya's second largest harbor and provides a useful base for military operations. The harbor can be used by ships of 26 ft draft at any state of the tide. Port facilities are located at Georgetown, on Penang Island, and also at Prai, on the mainland. Quayage for large ships is limited and considerable loading is done in the roadstead by means of lighters.

There are two shipyards at Penang which have a graving dock and two slipways for small craft of not over 450 tons. The workshops are capable of making ordinary repairs.

The harbor is on the main RR line between Singapore and Bangkok. Military supplies destined for Burma and shipped either to Bangkok or Singapore can be sent by rail to Penang, and thence trans-shipped to Burma ports.

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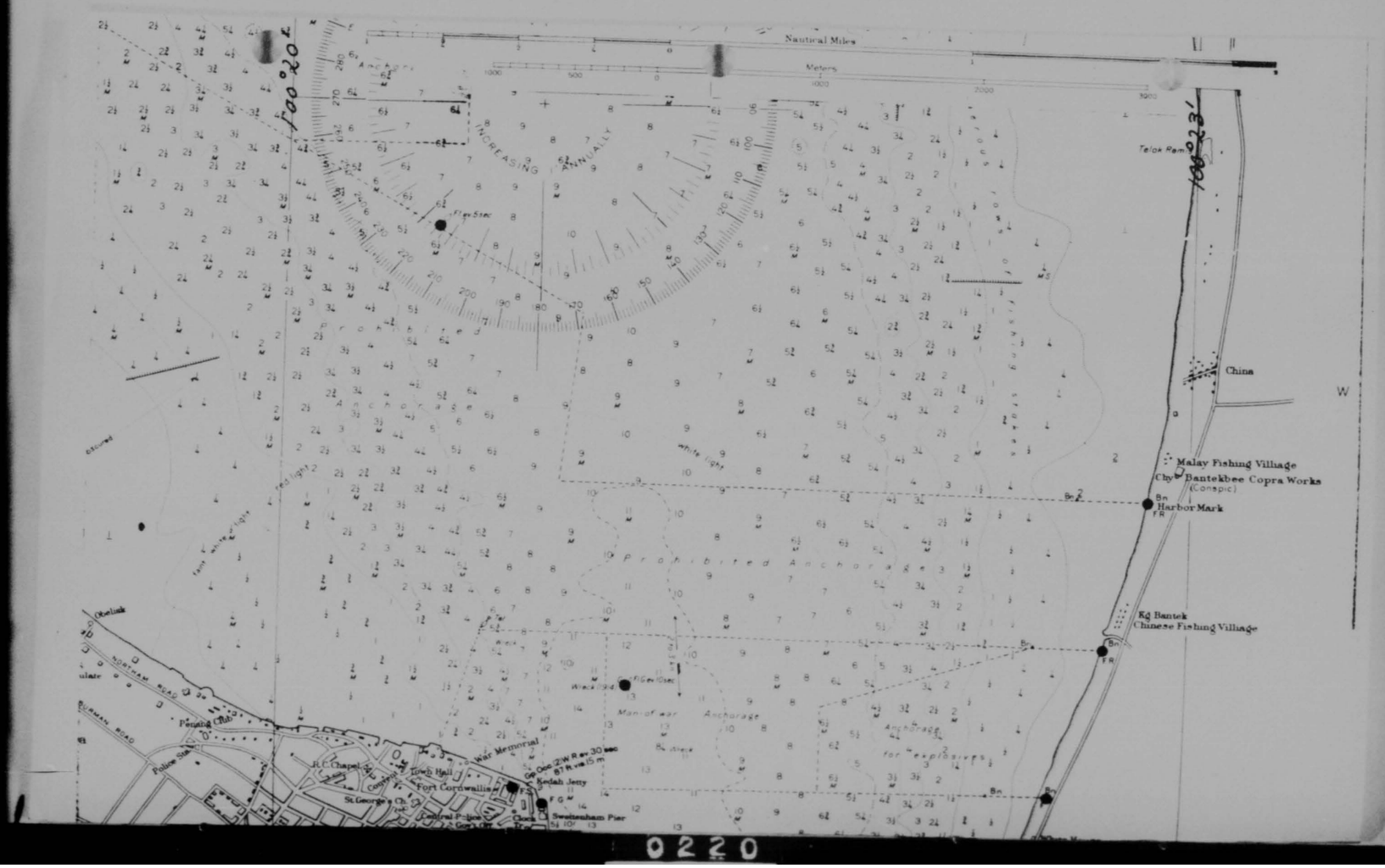
330.512 P1-MALAYA, PENANG ISLAND, GEORGETOWN.
App. 5° 25' N - 100° 22' E. ONI # 31774.

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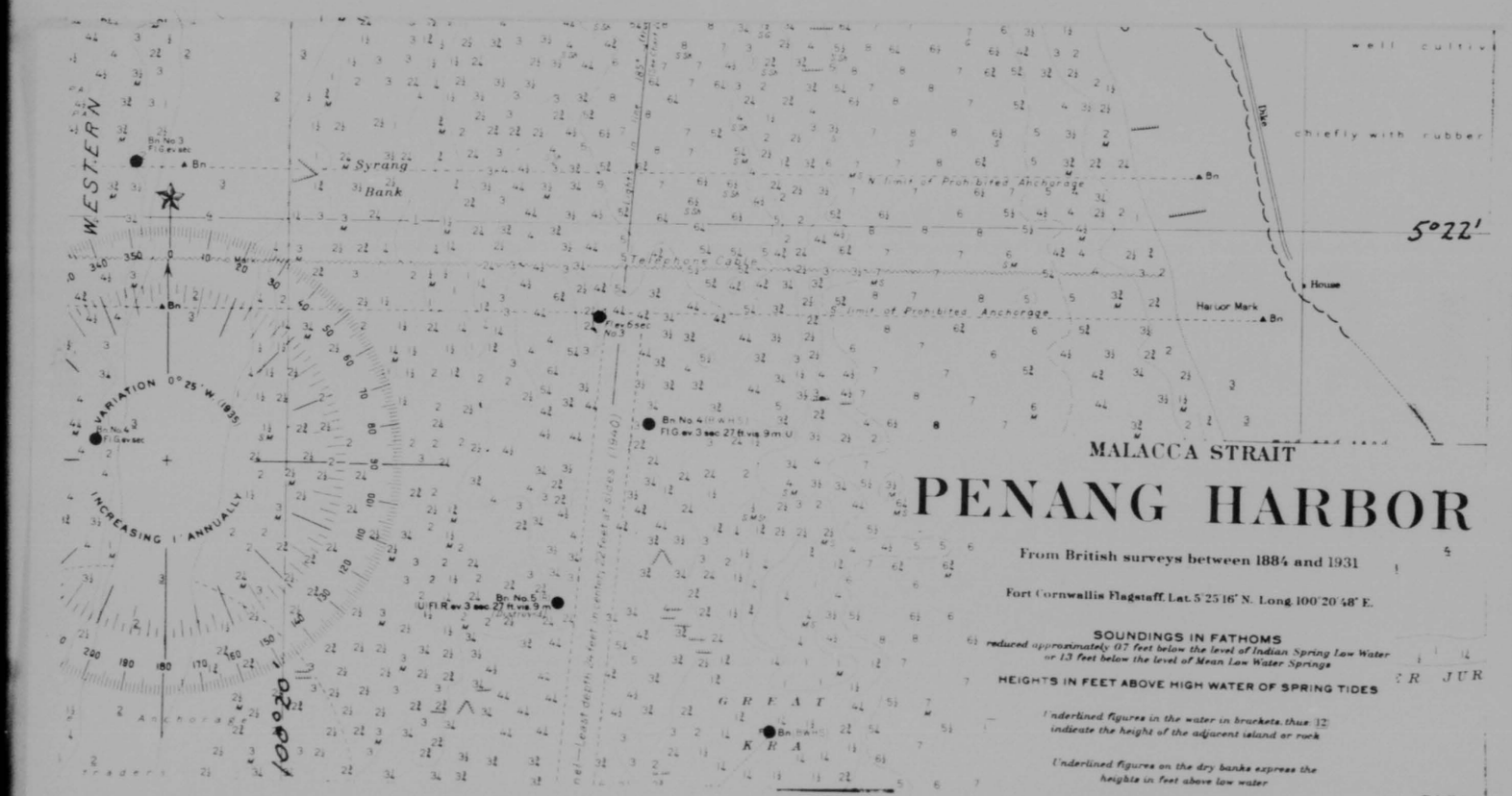
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April 1943

SINGAPORE HARBOR (WALLA) 1° 16' N 103° 56' E

One of the world's largest harbors, now a transit point for Japanese military and commercial shipping and a base of operations. The port consists of an inner and an outer harbor. The latter, Singapore Road, lies east of the town and provides excellent anchorage for a large number of ships of any size in from 7 to 12 fathoms of water. The inner harbor comprises an inshore anchorage under the shelter of a breakwater for as many as 40 coasting vessels up to 315 feet in length, and a channel, known as Keppel Harbor, running between Singapore Island on the north and the islands of Brani and Blakang Mati on the south.

The principal port facilities are at Keppel Harbor, which can be entered by all classes of vessels through either end of the channel at any state of the tide. Depths alongside the wharves range from 18 to 40 feet at low water and the total length of the quayage for ocean-going vessels is 14,715 feet. Most of the wharves are of heavy construction (concrete, wrought iron cylinder and blockwork, etc.), and are equipped with power-operated cranes. Railroad sidings are laid into many of the wharves and there is an ample number of warehouses. South of Keppel Harbor are two small islands, Pulau Island and Sarbo Island, each the site of a large petroleum tank farm from which ships can obtain bunker fuel. In addition to the wharf facilities, many lighters are available to load and unload cargo from vessels anchored in the roadstead.

Singapore Harbor has excellent machine shops capable of handling any repair work and also possesses five drydocks, the largest being 879 feet in length and 106 feet in breadth.

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April 1943

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SINGAPORE NAVAL BASE
(MALAYA)

01° 28' N
103° 50' E

This is a major naval base on the north side of Singapore Island facing the Strait of Johore. The base possesses a 1000 ft graving dock, a 50,000 ton floating drydock, and workshops capable of handling any ship repairs. Ample deep water anchorage and quayage is available. The petroleum tank farm has a capacity of 3,275,000 bbls. There is an ammunition depot of concrete construction, and ample space for the storage of other military supplies.

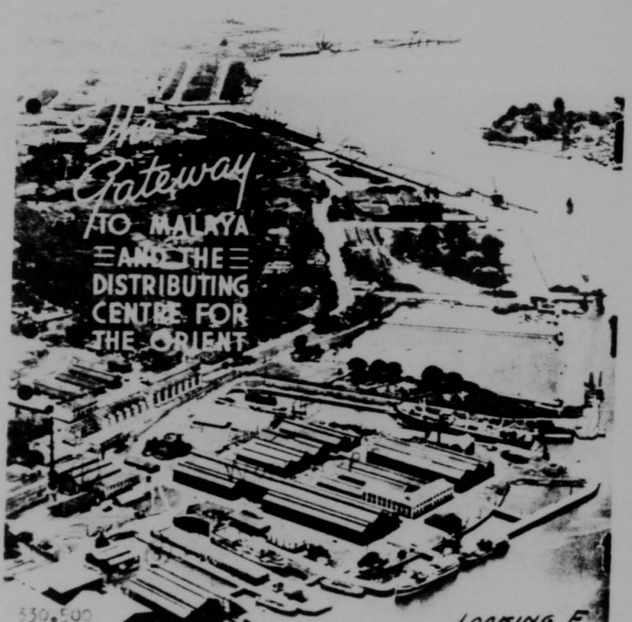
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SINGAPORE



SECRET

Singapore

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SINGAPORE

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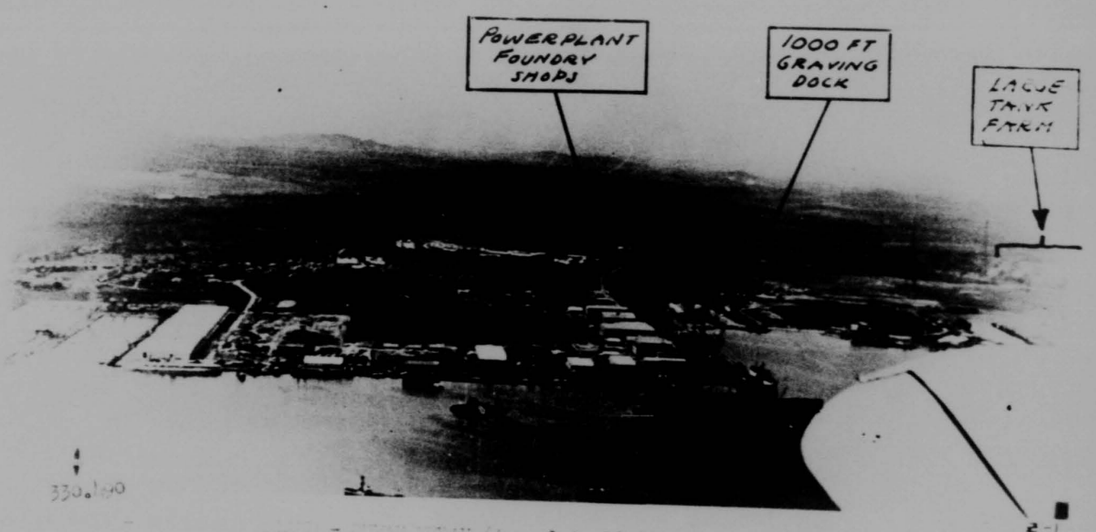
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330.1-40

- ... (App. Lat. 10 28' N. - Long. 103° 40' E.)
... Altitude, appr. 2000 feet. Taken 3/4/39.

ONI #32956

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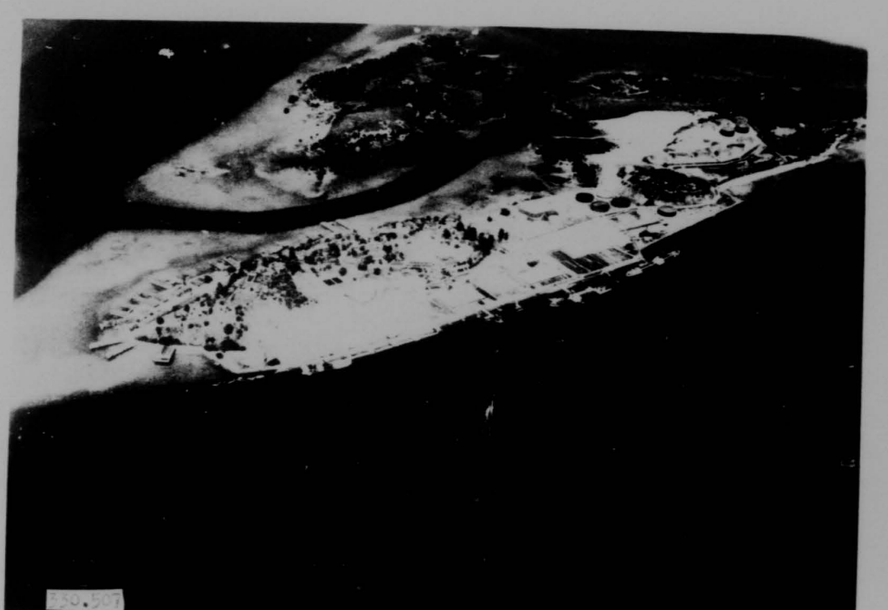
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BUKUM ISLAND TANK FARM (SINGAPORE) LOOKING SW

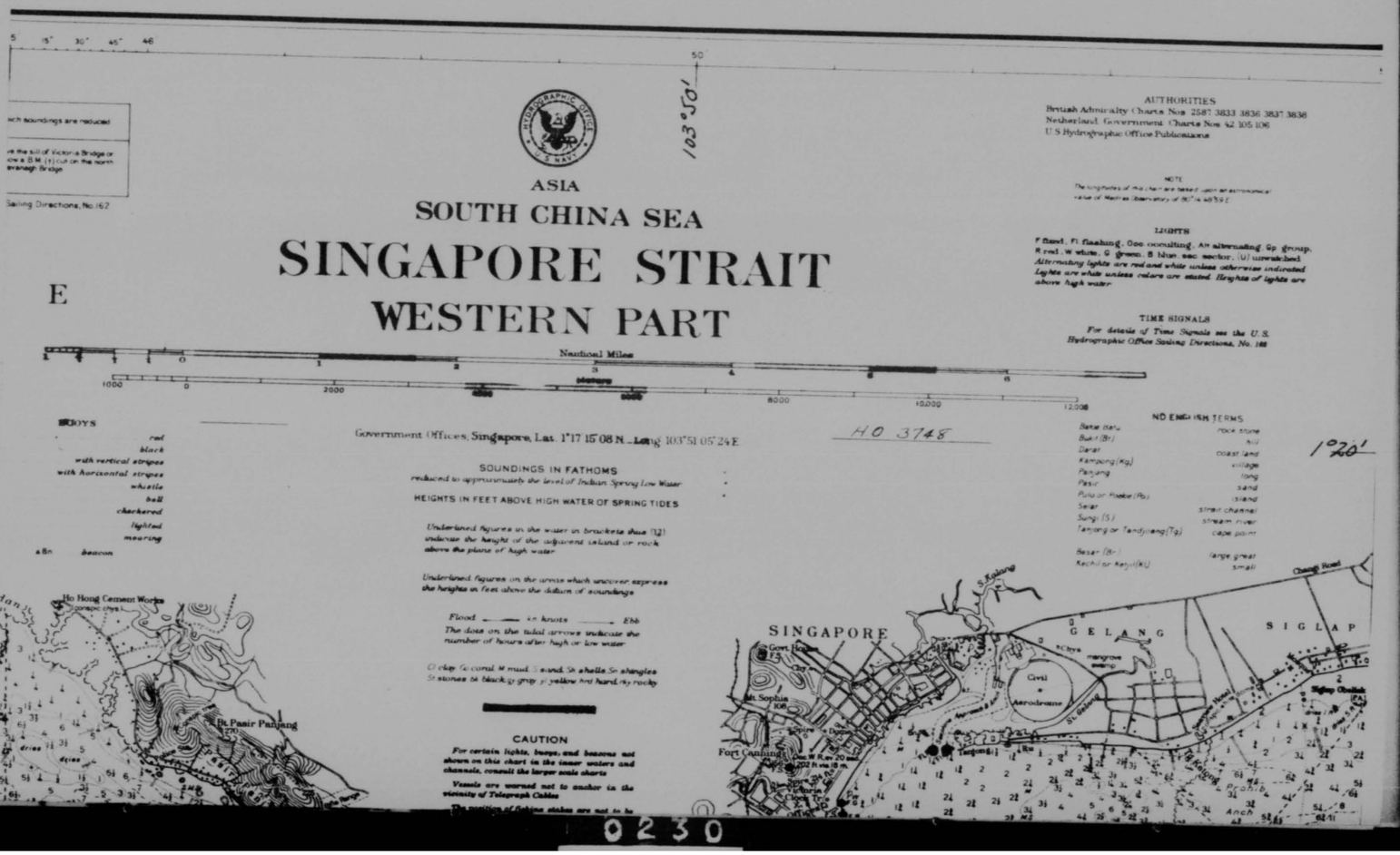
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ASIA

SOUTH CHINA SEA

SINGAPORE STRAIT

WESTERN PART

E

103°50'

1°20'

HO 3748

AUTHORITIES

British Admiralty Charts Nos 2587 3833 3836 3837 3838
Netherland Government Charts Nos 42 105 106
U S Hydrographic Office Publications

NOTE

LIGHTS

TIME SIGNALS

For details of Time Signals see the U.S. Hydrographic Office Sailing Directions, No. 168

Government Offices, Singapore, Lat. 1°17'15"08 N., Long. 103°51'05"24 E.

SOUNDINGS IN FATHOMS

reduced to approximately the level of Indian Spring Low Water

HEIGHTS IN FEET ABOVE HIGH WATER OF SPRING TIDES

Underlined figures in the water in brackets thus (12) indicate the height of the adjacent island or rock above the plane of high water

Underlined figures on the areas which uncover express the heights in feet above the datum of soundings

CAUTION

For certain lights, buoys, and beacons not shown on this chart in the inner waters and channels, consult the larger scale charts

Vessels are warned not to anchor in the vicinity of Telegraph Cables

SINGAPORE

GELANG

SIGLAP

Ho Hong Cement Works

Pt. Pasir Panjang

Fort Canning

Civil Aerodrome

Changi Road

0230

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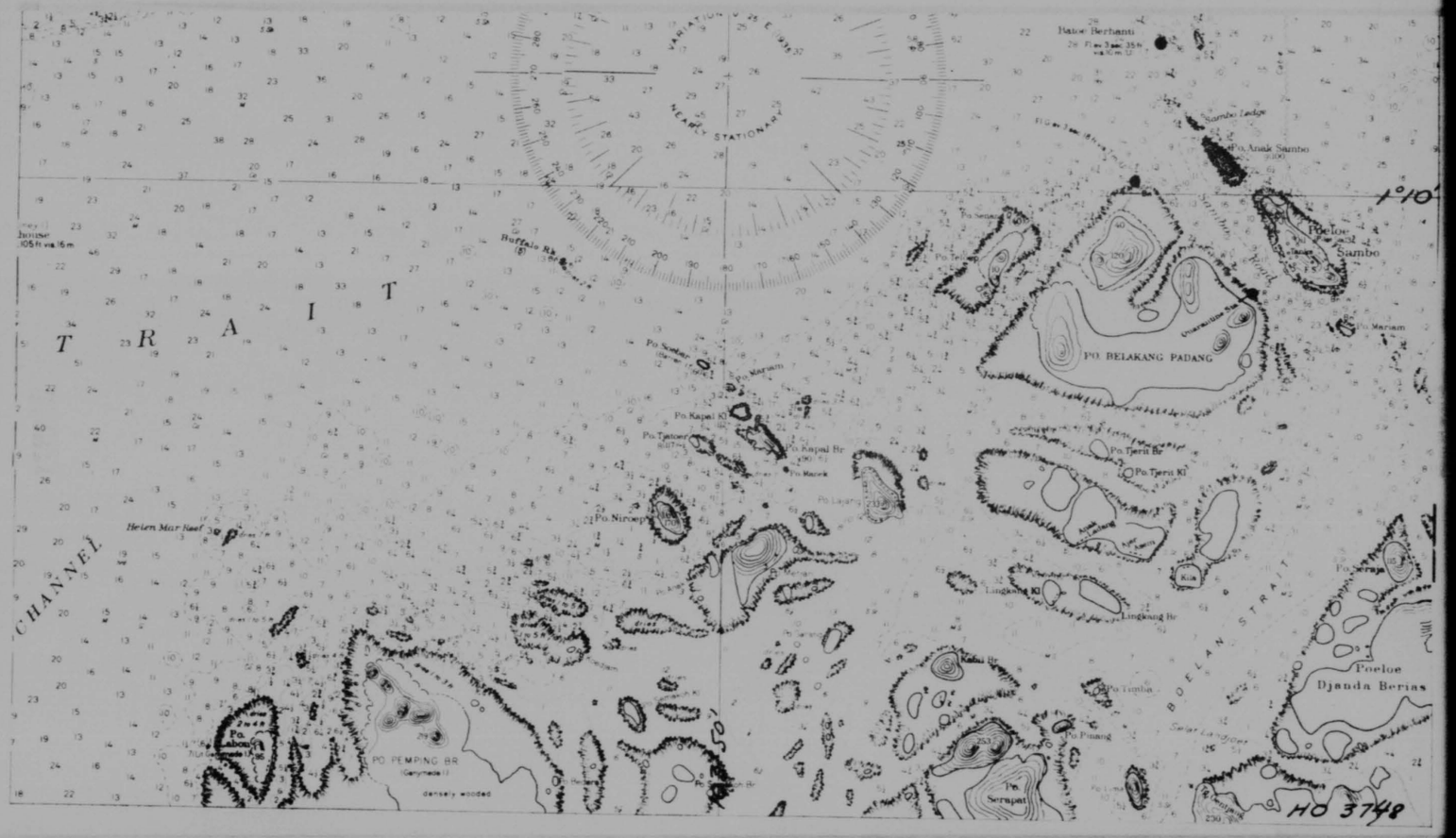


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April 1943

BALIKPAPAN
(DUTCH BORNEO)

01° 16' S
116° 49' E

There is a spacious harbor, (4 square miles) having a deep anchorage, safe in all seasons. Facilities include eight piers with light railway sidings, a number of warehouses, and a small shipyard. The oil refinery at Balikpapan is again in operation, and Japanese tankers are known to be using the harbor.

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BALIKPAPAN
(DUTCH BORNEO)

LOOKING N



BALIKPAPAN

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SECRET

April 1943

KOLAKA (PADAMARANG I) 04° 03' S 121° 25' E

CELEBES

Kolaka Harbor consists of an open roadstead where vessels are loaded by lighter. Kolaka and Padamarang Island a few miles offshore, comprise Japan's chief source of nickel ore.

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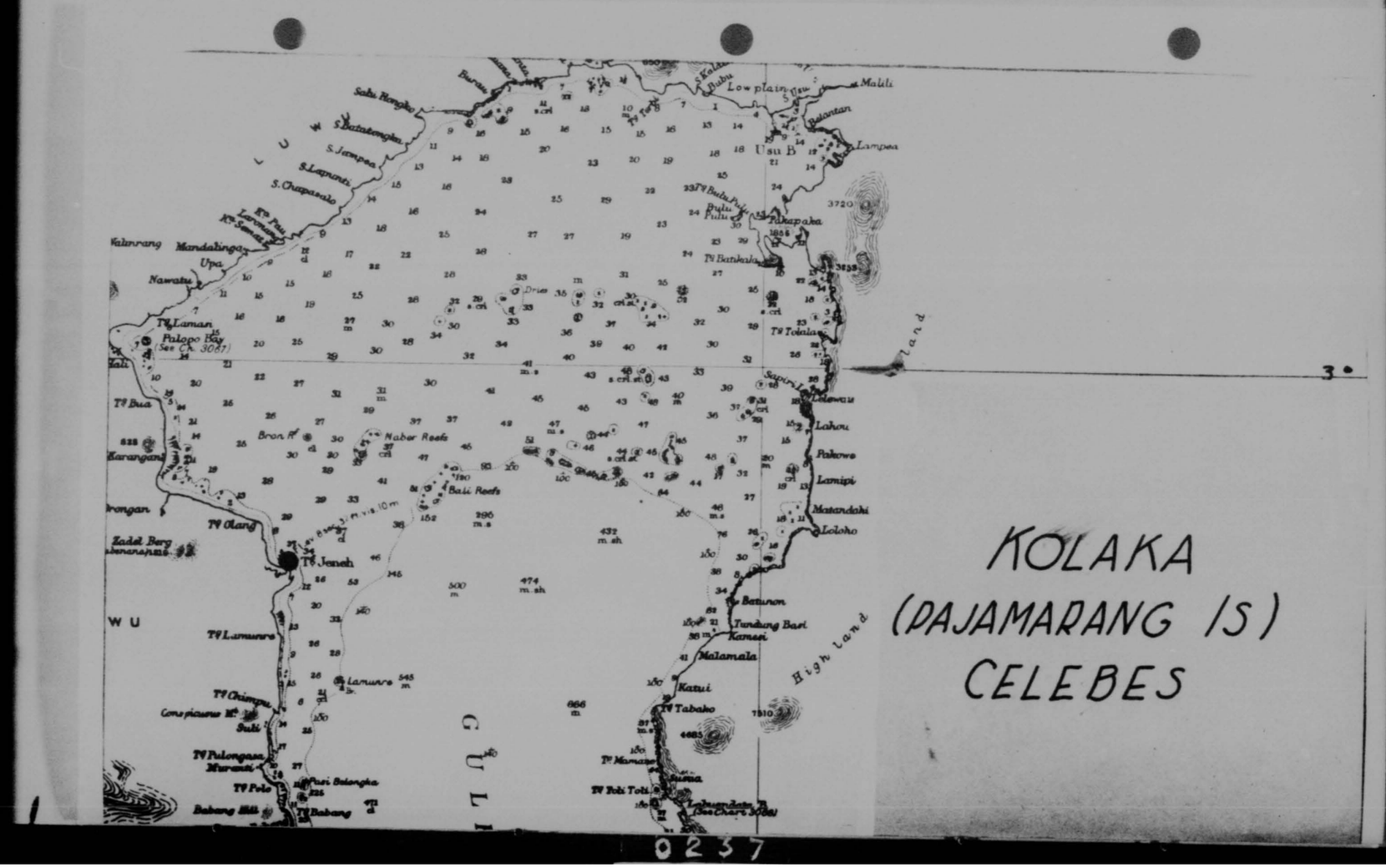
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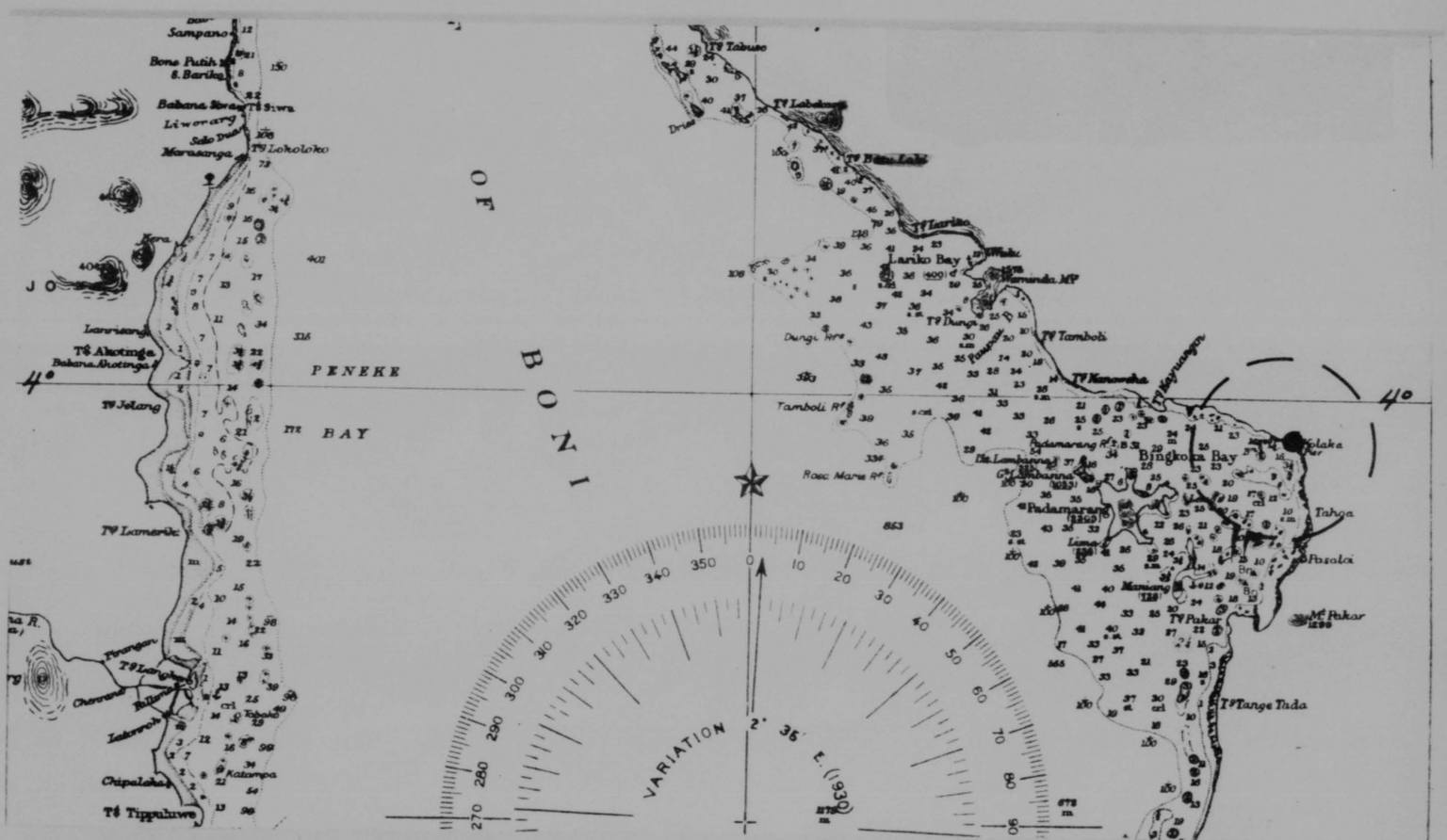


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April 1943

SECRET

LUTONG

(BRITISH BORNEO)

04° 30' N
114° 00' E

Lutong is Japan's greatest single source of oil. It is estimated that tankers will load 20,000,000 barrels of petroleum products at Lutong in 1943.

There are no harbor facilities. Naval forces vessels to remain 3 miles offshore. Oil is piped through five submerged sea-loading pipelines which are moored to buoys at the edge of the reef.

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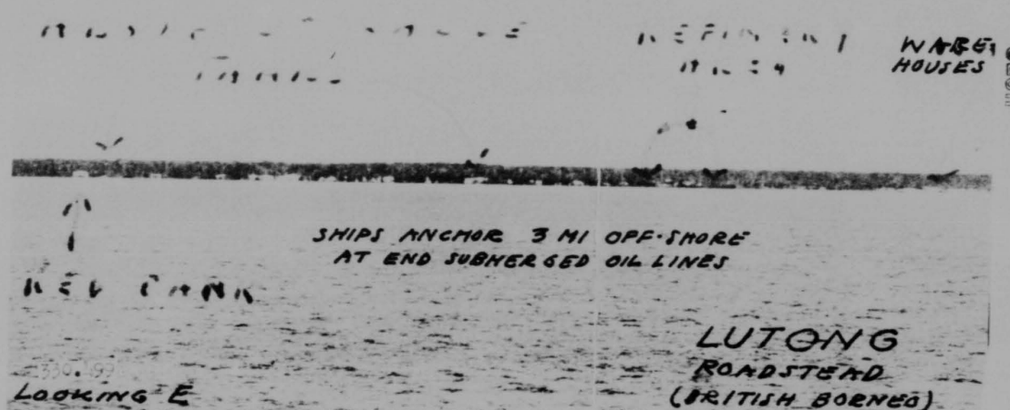
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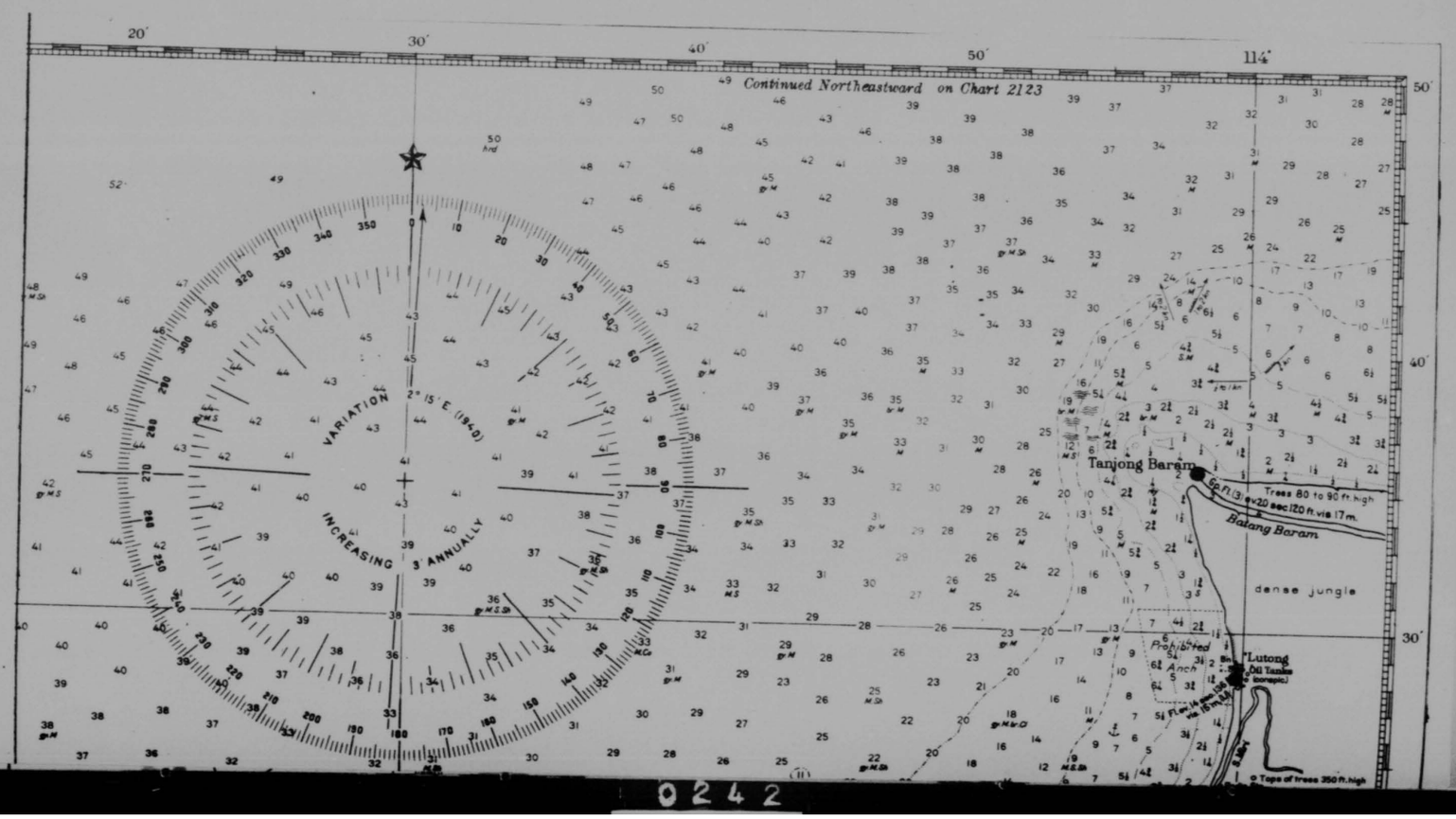


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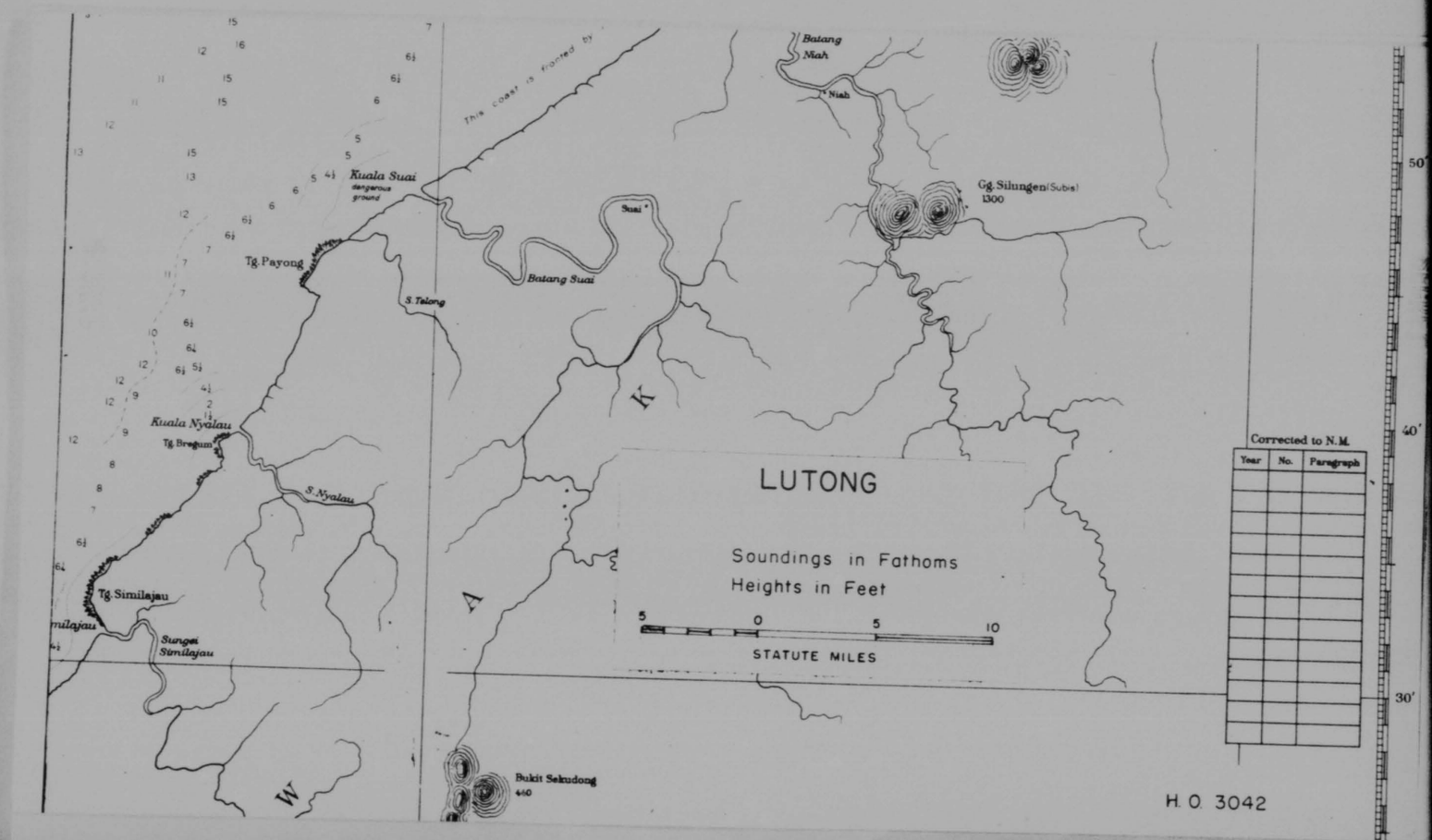


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April 1943

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PALEMBANG
(SUMATRA)

2° 59' N
104° 47' E

Palembang is a major oil-exporting harbor situated on the Moesi River about 53 miles from the sea. The bar at the river's mouth allows vessels of not more than 21 ft. draft to pass at high tide and tankers loading oil at Palembang cannot be filled to capacity. The partially loaded tankers approach and cross the bar at the height of the flood tide and proceed to tank farms near Singapore (Bukum Island, Sambo Island, etc.) to complete loading.

At Palembang there are large wharves for tankers at the refineries where the vessels take on as much oil as they can carry and still cross the Moesi's bar. The river peruses a winding course to the sea and is in several places no more than 200 yards wide. The sinking of a ship at such spots would prevent the export of oil from Palembang.

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PALEMBANG
(SUMATRA)
Pladjoe and Soengei Gerong Refineries



Palembang

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April 1943

TANDJONG PRIOK (BATAVIA) 6° 06' S
(JAVA) 106° 53' E

Tandjong Priok is an artificial harbor formed by two converging breakwaters. The harbor has an entrance which is only 137 yards wide and would be difficult to clear of ships with dispatch. There are 14,300 feet of quayage facilities for ocean-going vessels of not more than 31 ft. draft. The wharves are equipped with power cranes, warehouses and railroad sidings. The harbor is connected by rail with all parts of Java.

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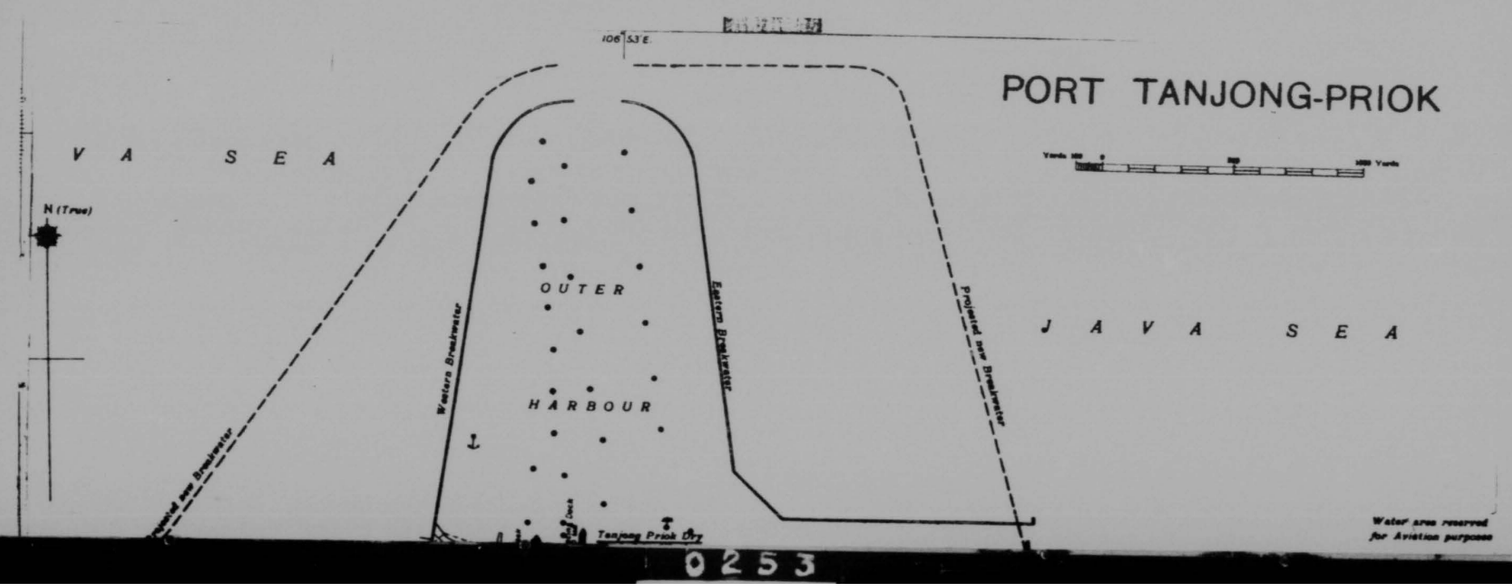
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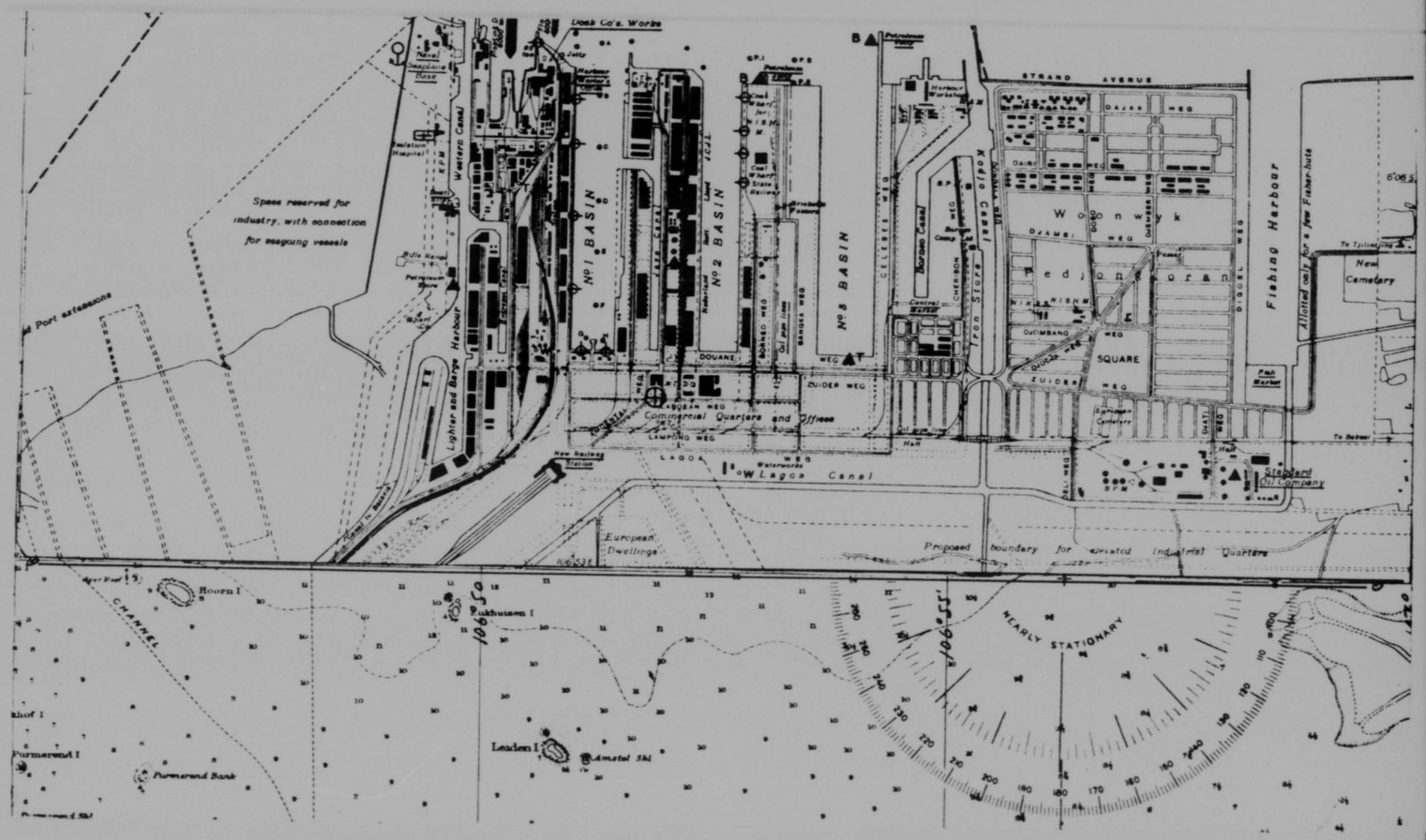


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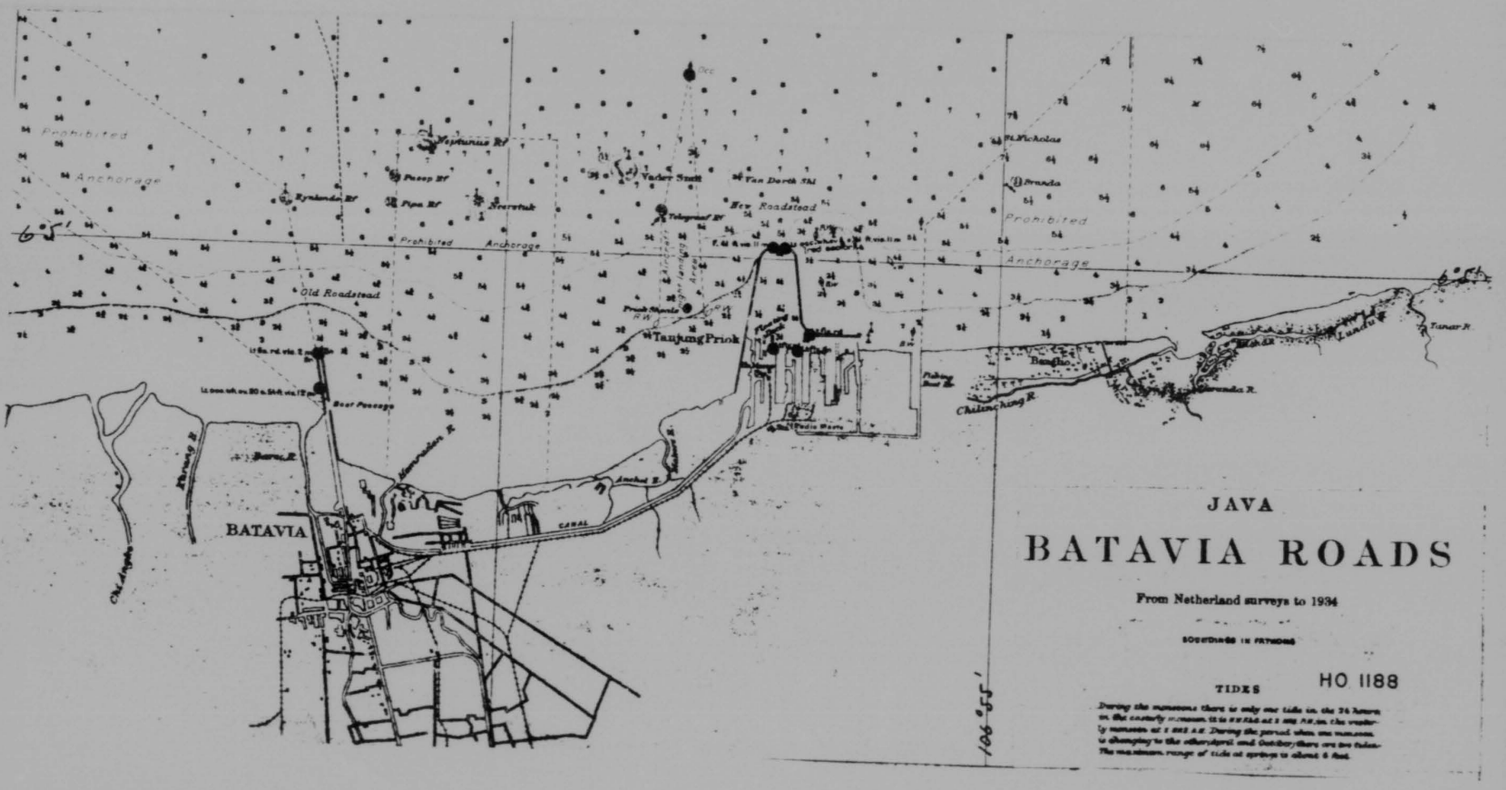
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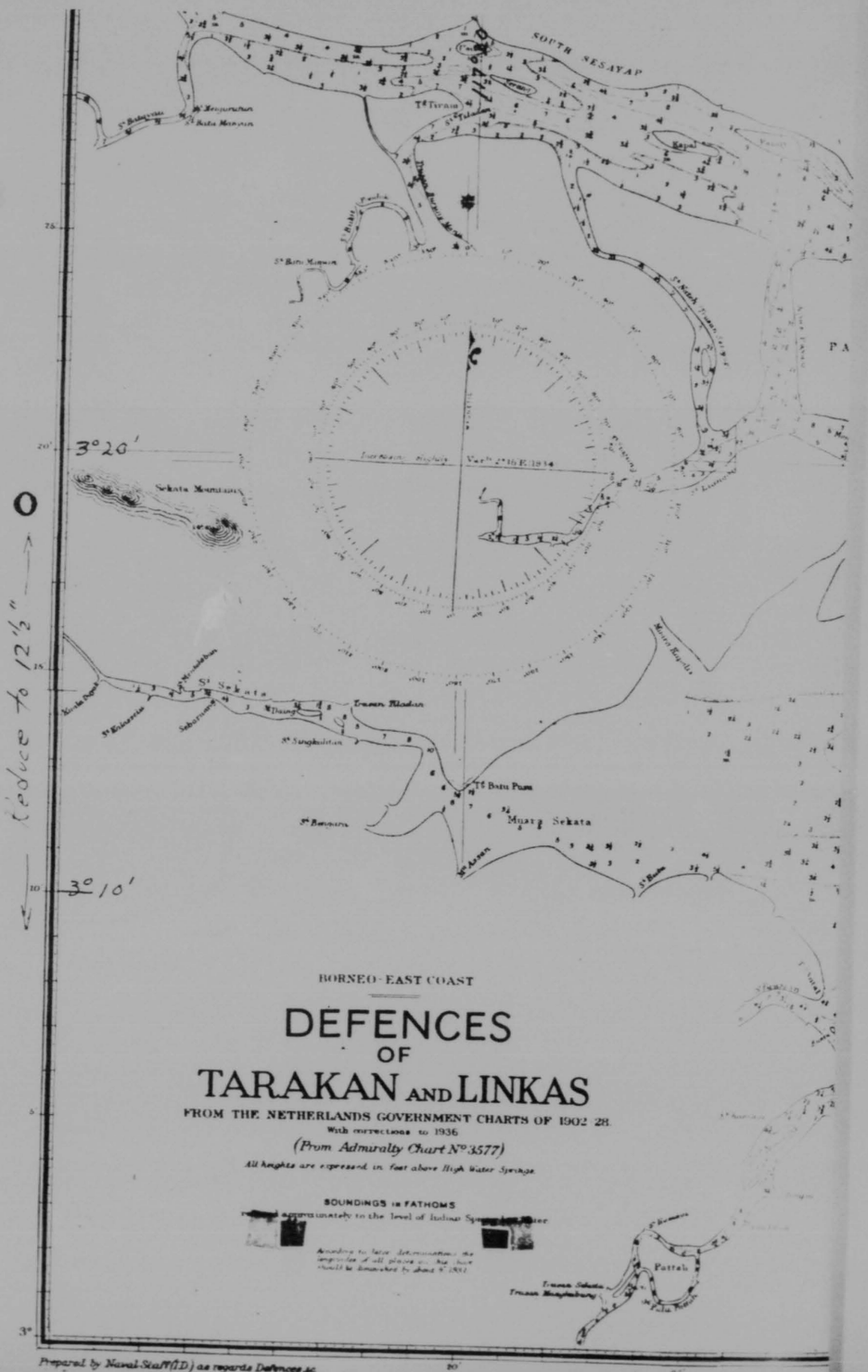


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BORNEO - EAST COAST

DEFENCES OF TARAKAN AND LINKAS

FROM THE NETHERLANDS GOVERNMENT CHARTS OF 1902-28

With corrections to 1936

(From Admiralty Chart No. 3577)

All heights are expressed in feet above High Water Springs

SOUNDINGS IN FATHOMS

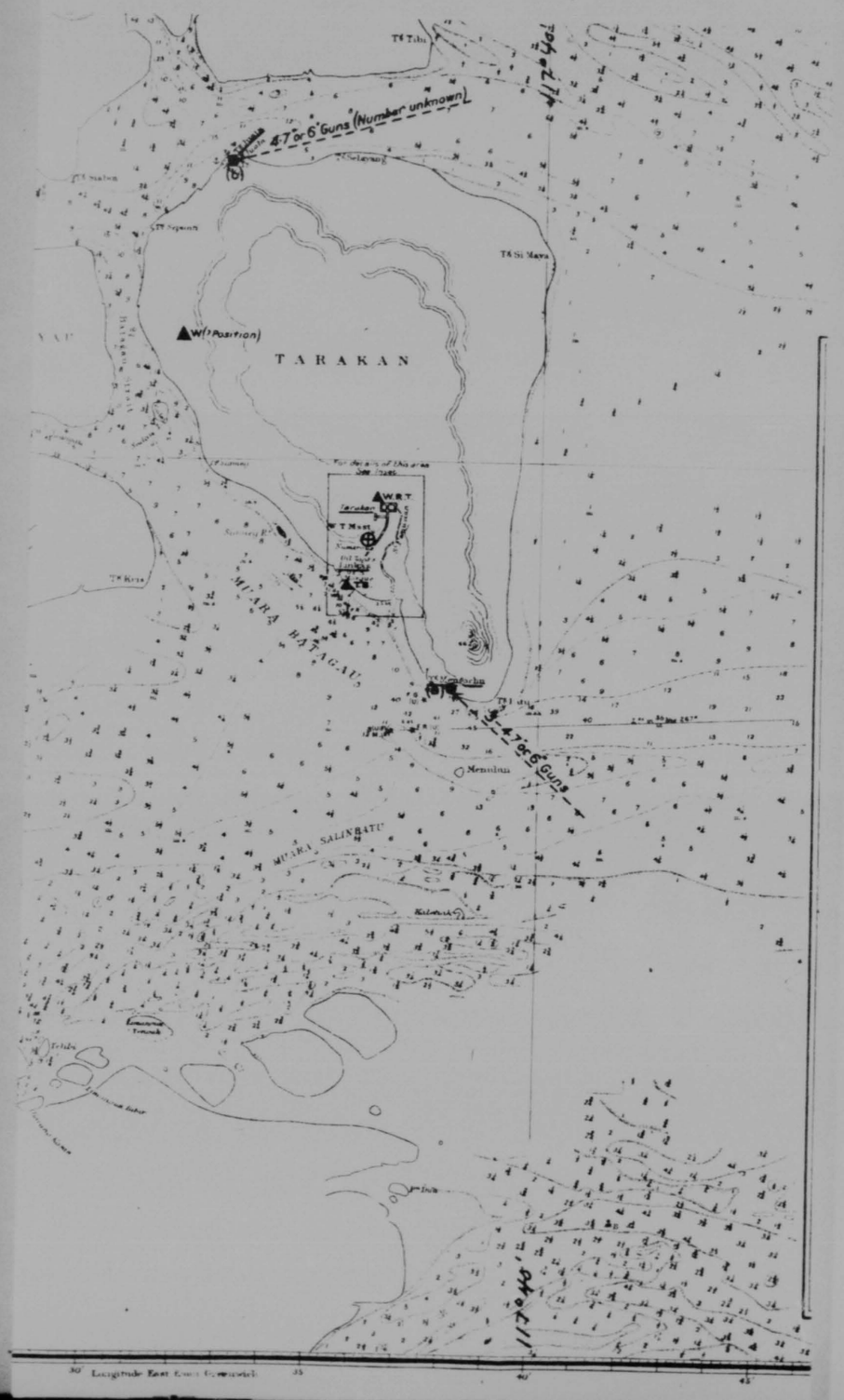
Prepared by Naval Staff (I.D.) as regards Defences &c.

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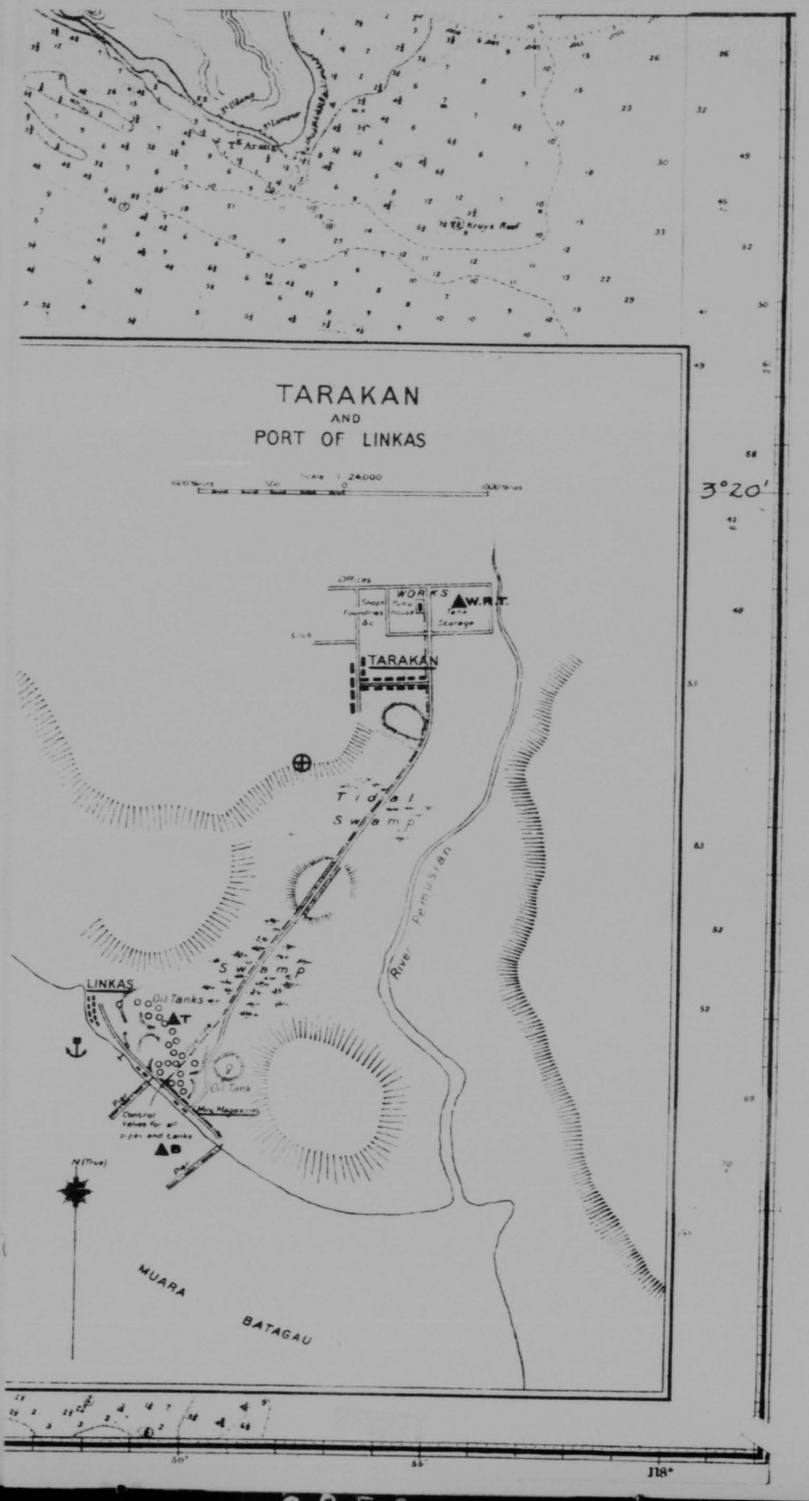
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April 1943 SECRET

SURABAYA 7° 12' S
(JAVA) 112° 43' E

Surabaya consists of a naval harbor and a commercial harbor, well-equipped with wharves, cranes, warehouses and ship repair facilities. The Dutch wrought considerable destruction upon this harbor before they withdrew, but the Japanese claim to have repaired the damage. It is known that ocean-going vessels are now using the harbor. Surabaya is connected by rail with all parts of Java.

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330.510

HARBOUR WORKSHOPS AND DOCKS OF THE SOURABAYA DRY DOCKS CO., SOURABAYA.

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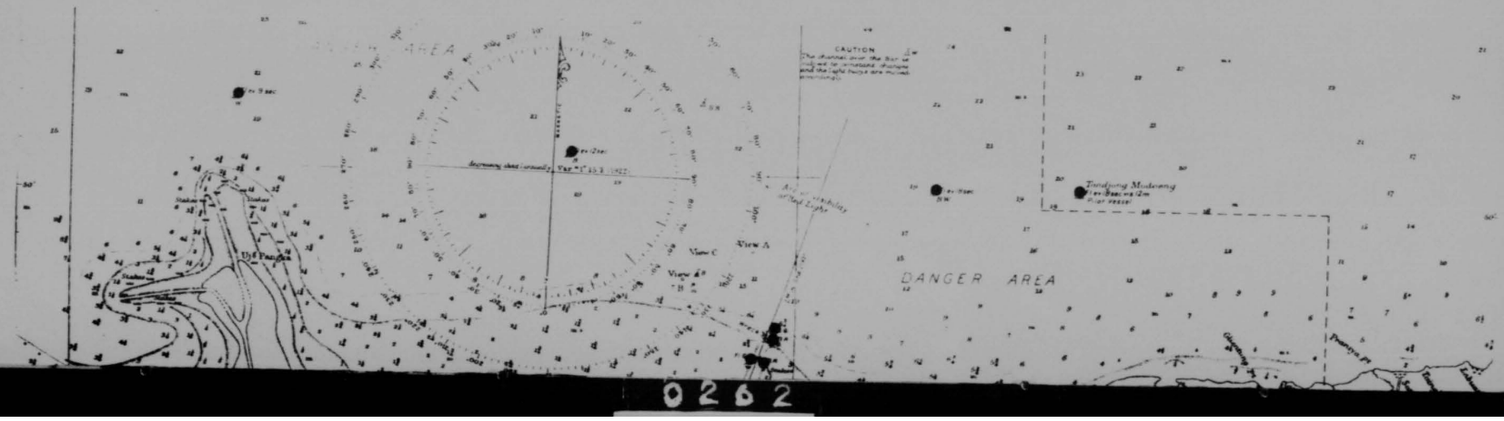
SURABAYA

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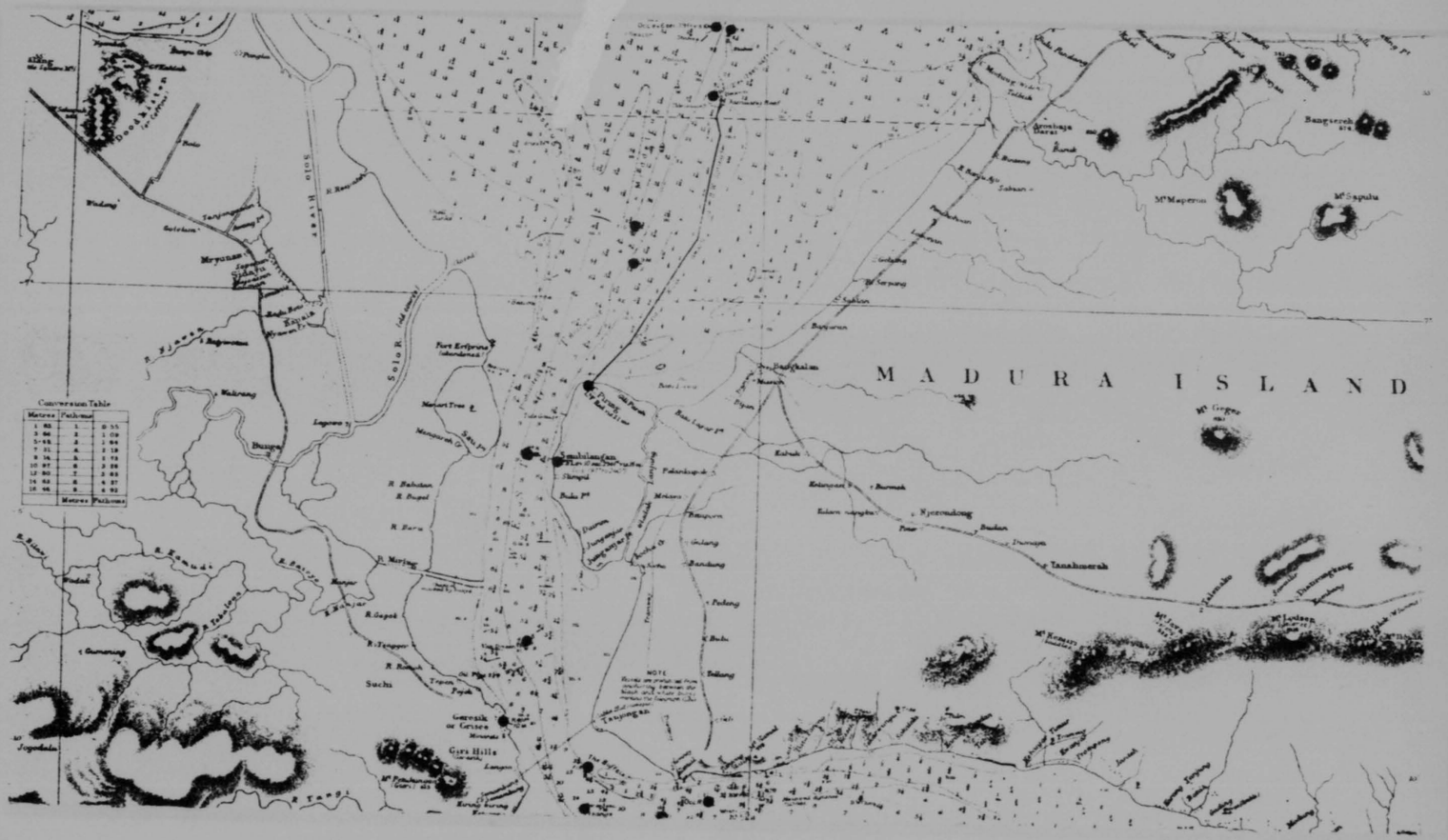


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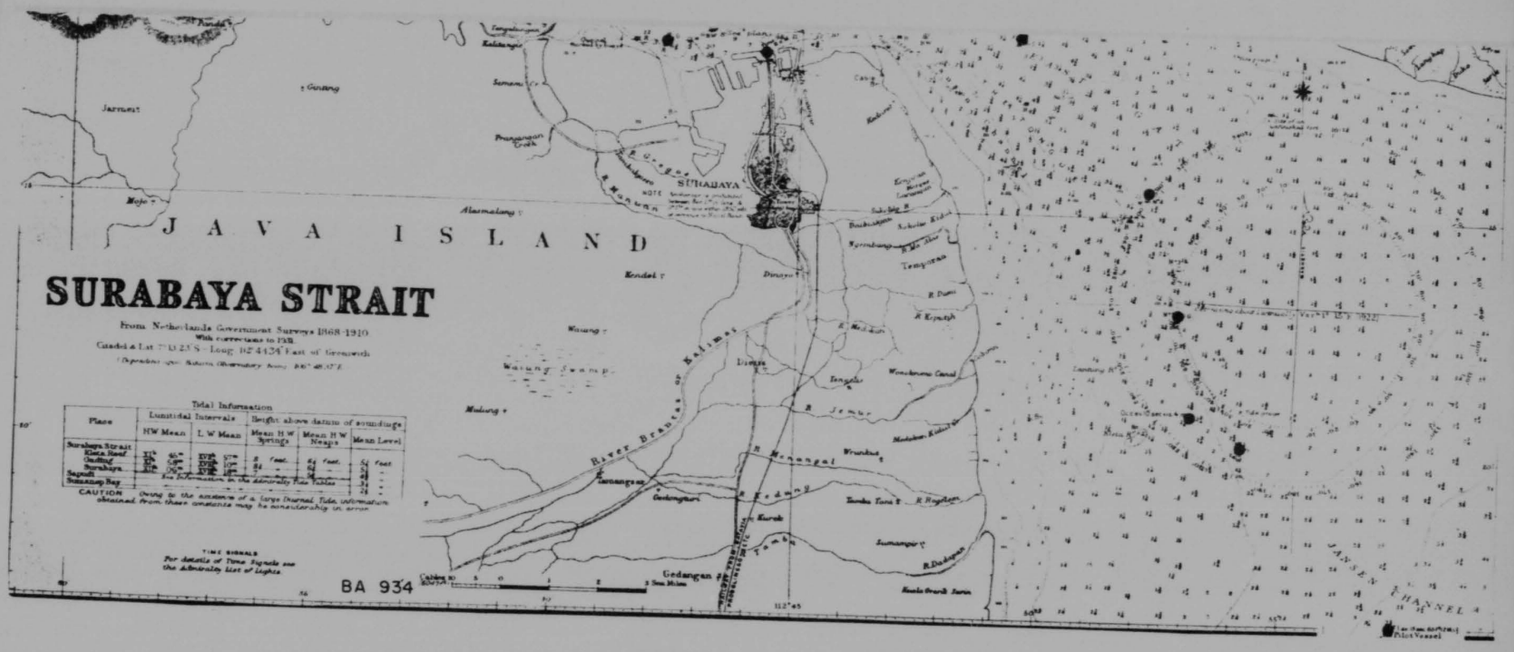


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Part V. Objective Folder
Target Index

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All targets in folders to 3/1/43, grouped by Areas

JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	JAPAN PROPER (90)			
	KARAFUTO (90.1)			
951	Port of Esutoru	One of 2 largest coal ports in Karafuto	49°08'N 142°02'E	973
952	Port of Maoka	One of Karafuto's two chief ports	47°03'N 142°03'E	968
953	Port of Otomari	One of Karafuto's two chief ports	46°38'N 142°46'E	966
954	Port of Honto	Only ice-free port in Karafuto	46°41'N 141°51'E	954
	HOKKAIDO NORTH (90.2)			
1048	Train Ferry Dock, Wakkanai	Terminal for train ferry Hokkaido-Karafuto	45°24'N 141°40'E	1048
	MURORAN (90.3)			
381a-d	Muroran Harbor Facilities	Important coaling piers	42°19'N 140°59'E	378
992a,b	Port of Otaru Facilities	Important coaling piers	43°12'N 141°00'E	992a
	HAKODATE (90.4)			
975	Western Wharf & Warehouses	Minor	41°46'N 140°43'E	974
976	Eastern Wharves & Warehouses	Minor	41°46'N 140°43'E	974
	AOMORI (90.5)			
993	Train Ferry Terminus (Aomori)	Important; terminus RR car ferry	40°50'N 140°44'E	993

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JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	AOMORI (90.5) (Continued)			
994	Warehouse Area (Aomori)	Minor	40°50'N 140°44'E	993
	AKITA (90.6)			
1069	Tsuchizaki Wharf	Port for Akita, small	39°45'N 140°04'E	1066
	KAMAISHI (90.8)			
190	Kamaishi Harbor	Important for area	39°16'N 141°54'E	189
	NIIGATA (90.9)			
1021	Wharves 1 & 2	Large warehouses; RR feeder lines	37°57'N 139°05'E	998
1022	Wharves 4 & 5	Large warehouses; feeder lines	37°56'N 139°04'E	998
1025	Wharf #3	Central warehouse	37°57'N 139°05'E	1005
	TOYAMA (90.11)			
862	Higashi Iwase Docks & Harbor	Rptd facilities for 10,000-ton vessels	36°46'N 137°14'E	862
867	Fushiki Docks & Harbor	No details	36°47'N 137°04'E	867
870	Nanao Docks & Harbor	Large, transhipment port, seaplane anchorage	37°02'N 137°00'E	870
	TOKYO (90.17)			
191	Mitsubishi Coal Depot	Only large coal depot in Kawasaki-Yokohama	35°30'N 139°43'E	NA

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JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17) (Continued)			
885	Takeshiba Pier	New construction		
886	Hinode Cho Pier	New, can handle six 2,000-ton ships	35°39'N 139°46'E	NA
887	Shibaura Wharf	Accommodates seven 6,000-ton ships	35°39'N 139°46'E	"
1432	Yokohama Harbor Passenger Wharves	Can handle 50,000-ton ships	35°38'N 139°46'E	"
1433	Yokohama Main Pier	Largest pier in Yokohama	35°27'N 139°39'E	"
1434	Fukagawa Pier)		35°27'N 139°39'E	"
1435	Tsukishima Pier)	3 piers can handle 18 ships-2,000 to 6,000 tons	35°39'N 139°48'E	"
1436	Tsukishima East Wharf)		35°39'N 139°47'E	"
1437	Mitsubishi Piecegoods Wharf, Warehouses	Handle war supply shipments	35°39'N 139°47'E	"
1438	Kyoritsu Warehouse	Stores frozen foods	35°30'N 139°43'E	"
1439	Yokohama Central Wholesale Market	Stores fresh food & fish	35°27'N 139°38'E	"
1440	Mitsubishi Warehouse	Handles war supplies	35°28'N 139°38'E	"
1441	Yokohama Warehouse, North	Important storage	35°27'N 139°39'E	"
1442	Yokohama Warehouse, South	Important storage	35°29'N 139°40'E	"
1443	National Silk Conditioning House	Large, present use unknown	35°28'N 139°39'E	"
1444	Yokohama Harbor Timber Basin	Large	35°27'N 139°39'E	"
1445	Yokohama Harbor Co-op Purchasing Whses	Important warehouses	35°26'N 139°40'E	"
1446	East Asia Development Co Whses	Present use unknown	35°29'N 139°39'E	"
1447	Hiraidzumi Drug Depot	Present use unknown	35°29'N 139°39'E	"
1448	Tsukiji Market & Wholesale Warehouse	Important food distributing center	35°29'N 139°40'E	"
1449	Kanda Market (Tokyo)	Supplements Tsukiji Market	35°40'N 139°46'E	"
1450	Koto Market (Tokyo)	Supplements Tsukiji Market	35°42'N 139°47'E	"
1451	Naniwa Warehouse	Present use unknown	35°41'N 139°48'E	"
1485	South Manchurian Wharf & Whses	Large, has two travelling cranes	35°28'N 139°39'E	"
1493	Toshin & Shinko Warehouses	War shipping	35°30'N 139°44'E	"
			35°27'N 139°39'E	"

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JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIZUOKA (90.18)			
1178	Docks & Harbor Facilities (Shimizu)	No details	35°00'N 138°30'E	1176
	NAGOYA (90.20)			
251	Nagoya Harbor	Important; 4th largest peace-time port	35°05'N 136°53'E	194
	MAIZURU (90.22)			
1032	Wharf 1-Tsuruga	Part of important military transhipment port	35°40'N 136°05'E	1033
1033	Wharf 2-Tsuruga	Part of important military transhipment port	35°40'N 136°05'E	1033
1034	Wharf 3-Tsuruga	Part of important military transhipment port	35°39'N 136°04'E	1033
1044	Maizuru Docks & Harbor Facilities	Rptd recent expansion	35°27'N 135°20'E	1039
	OSAKA (90.25)			
22	Kobe Harbor District #1	Most important section of Kobe Harbor	34°41'N 135°12'E	5
34	Kobe Harbor District #2	Important for coast-wise shipping	34°40'N 135°11'E	10
53	Osaka Harbor	One of Japan's important harbors	24°39'N 135°27'E	263
	OKAYAMA (90.27)			
1289	Uno Transport Base	Important port of embarkation	34°29'N 133°57'E	1295
	KURE (90.30)			
657	Kure Naval Base	Primary naval base	34°14'N 132°33'E	657

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JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KURE (90.30) (Continued)			
658	Kure Submarine Base	Submarine base, school, depot		
735	Army Transport Base	Ujina Port, principal military harbor	34°15'N 132°32'E 34°21'N 132°28'E	658 735
	SHIMONOSEKI (90.34)			
31	Port of Yawata	Important		
32	Port of Wakamatsu	Very important coal & ore port	33°52'N 130°48'E	28
33	Port of Tobata	Secondary	33°53'N 130°48'E	28
42	Port of Shimonoseki	Important, port of embarkation	33°54'N 130°49'E	29
44a	Moji Central Wharf	Important	33°57'N 130°56'E	43a
44b	Moji Southern Wharf	Important, takes ocean-going ships	33°57'N 130°58'E	44a
44c	Moji Coaling Station	Important	33°58'N 130°57'E	43a
44d	Komoriye Wharf	Secondary	33°56'N 130°58'E 33°55'N 130°57'E	43a 43a
	KURUME (90.35)			
1254	Miike Harbor (Mikawa)	Important coal export port		
1255	Hakata Harbor (Fukuoka)	Secondary	33°00'N 130°25'E 33°36'N 130°24'E	1243 664
	SASEBO (90.36)			
835	Nagasaki Wharves & Freight Yd	Important military traffic, terminus Shanghai run	32°45'N 129°52'E	835
836	Dejima Wharf, Nagasaki	Secondary	32°44'N 129°52'E	835
845	Sasebo Outfitting Wharf	Important, navy supply point	33°10'N 129°43'E	752

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JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SASEBO (90.36) (Continued)			
837	Imari Naval Harbor	Rptd minor naval station	33°16'N 129°53'E	-
	JAPANESE ISLANDS (91)			
	KURILE ISLANDS (91.1)			
120	Kakumabetsu Harbor	Base for seaplanes, submarines, destroyers	50°23'N 155°37'E	120
121	Buroton Harbor	Small vessels & seaplane base	47°09'N 152°13'E	121
122	Hitokappu Harbor	Possibly air & submarine base	44°59'N 147°43'E	122
123	Matsugahama Harbor	Rptd best harbor in Kurile group	43°44'N 146°42'E	123
125	Shiranuka Anchorage	More data required	44°21'N 146°27'E	125
126	Chinomiji Hakuchi Anchorage	More data required	44°15'N 146°10'E	126
127	Tomari Anchorage	More data required	43°43'N 145°31'E	127
128	Inemoshiri Anchorage	More data required	43°48'N 146°50'E	128
129	Shakotan Anchorage	More data required	43°52'N 146°49'E	129
130	Nemo Anchorage	More data required	49°36'N 154°48'E	130
131	Kuroishi Anchorage	More data required	49°25'N 154°49'E	131
132	Kashiwabara Anchorage	Possibly developed for destroyers or sea-planes	50°41'N 156°08'E	132
133	Otamaye Anchorage	More data required	50°11'N 155°39'E	133
134	Musashi Anchorage	More data required	50°00'N 155°23'E	134
135	Kujira Anchorage	More data required	50°17'N 155°21'E	135
136	Yotsuiwa Anchorage	More data required	50°17'N 155°55'E	136
137	Tokotan Anchorage	More data required	45°52'N 149°48'E	137
138	Tsurigane Anchorage	More data required	46°06'N 150°10'E	138

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KURILE ISLANDS (91.1) (Continued)			
139	Shimushiru Anchorage	More data required	46°52'N 151°51'E	139
140	Moyoro Anchorage	More data required	45°26'N 148°51'E	140
141	Tannemoye Anchorage	More data required	44°33'N 146°57'E	141
142	Naibo Anchorage	More data required	44°44'N 147°11'E	142
144	Bettobu Anchorage	More data required	45°17'N 148°03'E	144
	TAIHOKU (91.3)			
15a	Northwest Keelung Wharves	Important	25°09'N 121°44'E	15a
15c	Southwest Keelung Wharves	Important	25°08'N 121°44'E	15a
16	Eastern Keelung Wharves	Minor	25°08'N 121°44'E	15a
	TAIWAN WEST (91.4)			
100	Gosei Harbor	Expanded, believed important	24°15'N 120°32'E	100
101	Anping Harbor (Tainan)	Secondary	22°55'N 120°09'E	89
	TAIWAN EAST (91.5)			
64	Karenko Wharves	Most important harbor E coast Taiwan	24°00'N 121°38'E	61
65	Suo Basin	Rptd development into naval station	24°35'N 121°52'E	65

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAKAO (91.6)			
8a	Military Storehouses (Takao)	Important	22°37'N 120°17'E	8a
8b	Military Storehouses (Takao)	New; more data required	22°37'N 120°17'E	8a
	CHOSEN (KOREA) (84)			
	SEISHIN (84.1)			
13	Seishin Harbor	Important commercial, military port	41°47'N 129°50'E	13
14	Rashin Harbor	Major military & commercial port	42°13'N 130°18'E	14
15	Yuki Harbor	Important military & commercial port	42°20'N 130°24'E	15
	HEIJO (84.3)			
76	Chinnampo Harbor	Second largest tonnage handled in Chosen	38°43'N 125°25'E	76
77	Chinnampo Naval Fuel Depot	Coal storage	38°43'N 125°25'E	76
78	Rice Warehouses (Chinnampo)	One of largest rice storage depots in Chosen	38°44'N 125°25'E	76
79	Kenjiho Harbor	Serves Japan Iron Co Takes ships to 5,000 tons	38°44'N 125°38'E	66
80	Hosan Harbor	New, for ships to 4,000 tons	38°53'N 125°35'E	80
	GENZAN (84.4)			
89	Genzan Harbor	Growing modern all-purpose port	39°10'N 127°26'E	88
	CHOSEN EAST (84.5)			
49	Chumonshin Harbor	Small	37°54'N 128°50'E	49

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	CHOSEN EAST (84.5) (Continued)			
50	Hosui Harbor	Small	38°40'N 128°22'E	50
51	Sokuso Harbor	Small	38°12'N 128°36'E	51
52	Teira Harbor	Small	37°26'N 129°12'E	52
53	Koho Harbor	Small	36°41'N 129°28'E	53
54	Koko Harbor	Small	36°22'N 129°24'E	54
55	Hoko Harbor	Rptd submarine base	36°03'N 129°23'E	55
57	Taiho Harbor	Small	38°10'N 128°37'E	51
58	Bokuko Harbor	Small	37°33'N 129°07'E	58
	KEIJO (84.6)			
45	Jinsen Harbor	Large W Coast harbor	37°28'N 126°37'E	44
	FUSAN (84.7)			
97	Fusan Harbor	Principal commercial port in Chosen	35°06'N 129°03'E	97
	KOSHU (84.8)			
98	Reisui Harbor	Recently constructed port	34°44'N 127°44'E	98
99	Moppo Harbor	Growing importance, for small & medium ships	34°46'N 126°23'E	99
100	Kunsan (Gunzan) Harbor	One of primary Chosen rice shipping ports	35°59'N 126°41'E	100

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MANCHUKUO (MANCHURIA) (93)			
	MANCHUKUO EAST (93.2)			
85	Tashito Harbor Facilities	New, rptd large	39°50'N 124°25'E	85
	DAIREN (93.5)			
13	South Manchurian RR Piers	Very important facilities	38°56'N 121°40'E	1
14	Oil Piers	Major oil shipment point	38°55'N 121°41'E	2
15	Coal Pier	Major shipping point Manchukuo coal	38°58'N 121°38'E	1
	CHINA (83)			
	CANTON (83.4)			
50	Kowloon Wharves	Main wharfage; handles vessels of all sizes	22°18'N 114°10'E	55
51	Whampoa Wharves	New deepwater port for Canton; Jap transport point	23°06'N 113°26'E	51
52	Typhoon Refuge Harbor	Large protected junk harbor	22°19'N 114°10'E	55
	TSINGTAO (83.11)			
78	Piers & Whses (Tsingtao)	Largest concentration shipping between Chinwangtao & Yangtze River	36°05'N 120°19'E	78
79	Piers (Laoyao)	Rptd Japs dredging to handle output Tsaochwang mines (#65)	34°44'N 119°27'E	79

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TIENTSIN (83.12)			
1	New Japanese Coal & Ore Wharf	New, important, iron ore transhipment	39°01'N 117°39'E	4
3	Butterfield & Swire Co Wharves	Important shipping target	39°00'N 117°41'E	4
7	General Wharf Area	Important shipping target	39°00'N 117°40'E	4
14	Jardine Matheson Wharves	Important shipping target	39°07'N 117°12'E	11
22	Anchorage (Taku Bar)	Important shipping target	38°50'N 117°50'E	-
24	Piers (Chinwangtao)	Important shipping target, ice-free coal port	39°55'N 119°37'E	26
	FRENCH INDO-CHINA (85)			
	INDO-CHINA NORTH (85.1)			
28	Haiphong Docks	Second most important Indo-China port	20°52'N 106°41'E	N A
29	Coaling Station - Haiphong Harbor	Small	20°52'N 106°41'E	"
30	Port Redon Coal Storage & Dockyards	Handle approx 20% all Indo-China coal	20°59'N 106°45'E	"
31	Hongai Docks & Loading Facilities	Handle approx 35% Indo-China coal trade	20°57'N 107°04'E	"
32	Campha Port & Loading Facilities	Handle approx 30% Indo-China coal trade	21°01'N 107°21'E	"
33	Soc Anonyme d Const' Mecaniques	Only N Indo-China ship repair & heavy mach shop	20°51'N 106°40'E	"
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
28	New Government Port Area	New, extensive	13°42'N 100°35'E	31
29	Borneo Co Wharves	Also warehouses	13°43'N 100°31'E	26
30	China Thai Wharf Co	Cargo	13°43'N 100°31'E	26

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MALAY STATES (92)			
	MALAY STATES N (92.1)			
24-32	Penang Harbor	Malaya's second largest harbor; see targets below	5°25'N 100°21'E	
24	Government Pier (Penang)	Government marine depot	5°22'N 100°19'E	27
25	Shell Oil Pier, Penang	Fueling jetty	5°24'N 100°19'E	27
26	Church Street & RR Wharves	2 piers for small vessels	5°25'N 100°21'E	27
27	Swettenham & Victoria Piers, Penang	Main piers of harbor; ocean-going vessels	5°25'N 100°21'E	27
28	Mitchell's Piers, Penang	Small	5°24'N 100°22'E	27
29	Lighter Pier, Penang	Small	5°23'N 100°23'E	27
30	Coal Wharf Area, Penang	Coaling quay for lighters	5°23'N 100°23'E	27
31	Penang Harbor Board Area	Workshops, graving dock, slipway	5°24'N 100°23'E	27
32	Straits S.S. Dockyard, Penang	Small slipway, shops	5°24'N 100°23'E	27
33-36	Port Swettenham	Malaya's third largest harbor; see targets below	3°00'N 101°24'E	
33	Shell Oil Pier	Fueling pier, small storage	3°00'N 101°23'E	35
34	Northern Wharves Area	Small Wharves	3°00'N 101°23'E	35
35	Southern Wharves Area	Large Wharves	3°00'N 101°23'E	35
36	Standard Oil Co Pier	Fueling pier storage	3°00'N 101°23'E	35
37	Kuala Dungun Harbor	Iron ore export; million tons during S W monsoon	4°47'N 103°26'E	37
39	Tumpat Harbor	Iron & manganese ore exports	6°13'N 102°11'E	39
40	Kota Bahru Harbor	Iron ore export	6°09'N 102°14'E	40
41	Endau Harbor	Iron ore export, April-Oct.	2°40'N 103°38'E	41
42	Kemaman Harbor	Iron ore export	4°15'N 103°26'E	42

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SINGAPORE (92.2)			
10-14	Singapore Harbor	One of world's largest; see targets below	1°16'N 103°51'E	52
10	Singapore Harbor Board Area	Wharves & shops, two large drydocks, power plant	1°16'N 103°49'E	52
11	P-O & West Wharf Area	Large wharves & warehouses	1°16'N 103°50'E	52
12	Empire Dock Area	Ship basin, wharves, warehouses	1°16'N 103°50'E	52
13	Victoria & Albert Dry Dock Area	Two large drydocks, workshops	1°16'N 103°51'E	52
14	Telok Ayer Basin Area	Lighter basin	1°17'N 103°51'E	52
38	Batu Pahat Harbor	Iron & bauxite ore export	1°52'N 102°55'E	38
	BURMA (82)			
	BURMA SOUTH (82.2)			
11	Dock area (Rangoon)	Facilities for 20-30 deep-sea ships	16°46'N 96°10'E	14
12	Port Comm. Shops (Rangoon)	Maintains dredges, tugs, etc for port	16°46'N 96°10'E	14
13	Moulmein Harbor	Small wharves, light construction	16°29'N 97°37'E	4
	NETHERLANDS EAST INDIES (94)			
	SUMATRA NORTH (94.1)			
13	Sabang Harbor	Jap fueling station & naval base	5°53'N 95°19'E	1
14	Belawan-Deli Harbor (Port Belawan)	Chief harbor of Sumatra	3°47'N 98°41'E	23
15	Pankalan Brandon Harbor	Oil export harbor	4°02'N 98°17'E	15
16	Pankalan Susu Harbor	Major oil export harbor	4°07'N 98°12'E	16

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SUMATRA NORTH (94.1) (Continued)			
17	Tanjoeng Oeban Harbor	Oil fueling station	1°04'N 104°12'E	17
18	Tanjoeng Pinang Harbor	Bauxite export harbor	0°55'N 104°27'E	18
19	Olehleh Harbor	Harbor for connection to Sabang Island	5°34'N 95°18'E	19
20	Lho' Seumaweh Harbor	Small	5°11'N 97°08'E	4
21	Bengkalis Harbor	Fishing port	1°28'N 102°06'E	21
22	Sibolga Harbor (Tapanuli Bay)	Main W coast harbor	1°44'N 98°45'E	22
	SUMATRA SOUTH (94.2)			
53	Palembang Harbor	Large; oil export	2°59'S 104°47'E	53a
53a	Palembang Harbor Coaling Wharf	-	3°01'S 104°45'E	53a
53b	Government Wharf & Warehouses	-	2°59'S 104°46'E	53a
53c	Small Tanker Dock	At Pladjoe refinery	2°59'S 104°48'E	61
53d	Large Tanker Dock - Shell	For Pladjoe refinery	2°59'S 104°50'E	61
53e	Large Tanker Dock - Standard	For Standard refinery	2°59'S 104°50'E	61
53f	N.V. Industrieele Mij	Small shipyard at Palembang	2°59'S 104°45'E	75
54	Emma Haven Harbor	Main W coast harbor	1°00'S 100°22'E	54
54a	Wharves & Warehouses	Four wharves at Emma Haven	1°00'S 100°22'E	54
54b	Emma Haven Coaling Quay	Outlet for Umbilan coal mines	1°00'S 100°22'E	54
54c	Wharf Workshop	Minor repairs	1°00'S 100°22'E	54
55	Oosthaven Harbor	Nearest harbor to Java	5°28'S 105°19'E	55
56	Tandjoeng Pandan Harbor	Tin ore export, Billiton Island	2°45'S 107°38'E	56
57	Muntok Harbor	Tin export	2°04'S 105°10'E	57
58	Pangkal Pinang Harbor	Tin export	2°08'S 106°09'E	58

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SUMATRA SOUTH (94.2) (Continued)			
59	Blinyu Harbor (Banka Island)	Minor	1°38'S 105°47'E	59
60	Sungei-Liat Harbor (Banka Island)	Minor	1°51'S 106°08'E	60
	JAVA (94.3)			
145a	Surabaya Commercial Harbor	Largest in N E I	7°12'S 112°43'E	174
145b	Surabaya Naval Harbor	Largest in N E I	7°12'S 112°44'E	174
146	Tandjong Priok Harbor	Batavia's harbor	6°06'S 106°53'E	177
147	Cheribon Harbor	Small N coast harbor	6°43'S 108°34'E	147
148	Semarang Harbor	Medium sized N coast harbor	6°57'S 110°25'E	148
149	Tjilatjap Harbor	Only good S coast harbor	7°44'S 109°00'E	149
150	Tegal Harbor	Small	6°51'S 109°08'E	150
151	Pekalongan Harbor	Small	6°51'S 109°41'E	151
152	Rembang Harbor	Small	6°41'S 111°21'E	152
153	Pasuruan Harbor	Small	7°42'S 112°56'E	153
154	Probolingo Harbor	Small	7°43'S 113°13'E	154
155	Panarukan Harbor	Small	7°41'S 113°56'E	155
156	Kalianget Harbor	Salt export	7°03'S 113°57'E	156
157	Banyuwangi Harbor	Nearest to Bali	8°13'S 114°23'E	157
158	Merak Harbor	Nearest to Sumatra	5°56'S 106°00'E	158
	BORNEO SOUTH (94.4)			
220	Balikpapan Harbor	Oil export; suitable for large naval base	1°16'S 116°49'E	219
221	Tarakan (Linkas) Harbor	Fuel Oil export point	3°17'N 117°36'E	221
222	Pontianak Harbor	Main W coast harbor	0°01'N 109°20'E	222

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	BORNEO SOUTH (94.4)(Continued)			
223	Banjermasin Harbor	Main S coast harbor	3°20'S 114°35'E	223
	CALEBES - TIMOR (94.5)			
205	Ampenan Harbor	Small; Lombok's main trading center	8°34'S 116°04'E	205
206	Amoerang Harbor	Minor	1°12'N 124°34'E	206
207	Buleleng Harbor, Singaradia	Small; Bali's main trading center	8°06'S 115°06'E	207
208	Dilly Harbor	Main port of Portuguese Timor	8°34'S 125°37'E	208
209	Gorontalo Harbor	Minor	0°30'N 123°08'E	209
210	Kema Harbor	Minor	1°22'N 125°05'E	210
211	Kendari Harbor	Believed to be Jap base	4°02'S 122°40'E	211
212	Kolaka Harbor	Nickel ore export point	4°03'S 121°25'E	212
213	Koepang Harbor	Main port of Dutch Timor	10°10'S 123°35'E	213
214	Koeandang Harbor	Minor	0°51'N 122°55'E	214
215	Labuan Haji Harbor	Minor	8°42'S 116°34'E	215
216	Macassar Harbor	Main harbor in Celebes	5°08'S 119°24'E	202
217	Manado Harbor	Minor	1°30'N 124°50'E	217
218	Pare Pare Harbor	Minor	3°59'S 119°37'E	218
	PHILIPPINES (96)			
	P. I. (NORTH 96.1, SOUTH 96.2)			
2	Portsbayanga	Port for largest iron mine in Philippines	14°19'N 122°40'E	N A
3	Malaguit Bay	Port for third largest iron mine in Philippines	14°17'N 122°48'E	"
5	Masinloc	Port largest chrome production Philippines	15°33'N 119°56'E	"

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	PHILIPPINES (96.1,96.2)(Continued)			
7	Balurute	Port for high grade chrome ore shipment	15°45'N 119°53'E	N A
9	San Fernando la Union	Shipping point 90% Philippine copper ore	16°37'N 120°19'E	"
11	Manila piers, Port district	Center Manila shipping & storage	14°35'N 120°58'E	"
51	Pambujan Sur	Port for second largest iron ore producer	11°19'N 125°40'E	"
61	Cebu Port	Port of second largest city in Philippines	10°20'N 123°55'E	"
66	Santa Anna	Port of Davao; southern enemy base	7°04'N 125°36'E	"
67	Legaspi	Southern Luzon shipping, RR terminus	13°10'N 123°44'E	"
	BRITISH PACIFIC ISLANDS (81)			
	BORNEO NORTH (81,1)			
1	Kuching Harbor	Fuel, repair facilities	1°34'N 110°21'E	1
2	Sadong Harbor	Small coal port	1°23'N 110°45'E	2
3	Miri Harbor	Oil export	4°24'N 114°00'E	3
4	Jesselton Harbor	N terminus of RR	5°59'N 116°05'E	4
5	Kudat Harbor	Small	6°53'N 116°51'E	5
6	Sandakan Harbor	Large; fuel, repairs	5°50'N 118°07'E	6

*New target to be included in Folder revision

N A No number yet assigned when this list prepared

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JAPAN - NAVAL BASES AND SHIPYARDS

All targets in folders to 3/1/43, grouped by Areas

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	HAKODATE (90.4)			
974	Hakodate Dock Yard	Secondary ship repair yard	41°47'N 140°42'E	974
	AOMORI (90.5)			
996	Naval Base and Air Sta (Ominato)	Secondary base for destroyers, aircraft, etc.	41°16'N 141°09'E	996
	MITO (90.14)			
1477	Kisarazu Fleet Fueling Base	Important; Tokyo Bay fueling base for fleet	35°23'N 139°55'E	373
	TOKYO (90.17)			
	NAVAL BASES			
	Yokosuka Naval Base	Targets 274-1486 Navy Adm Hq, capital ship bldg	35°17'N 139°40'E	
274	Shipyard & Docks, Yokosuka Naval Base	(See Shipyards)		
276	Experimental Laboratories & Ordnance Plants	Very important	35°17'N 139°40'E	N A
277	Refitting Berths for Battleships & Cruisers	Large capacity	35°17'N 139°40'E	"
278	Yokosuka Naval Barracks	Base personnel	35°17'N 139°40'E	"
282	Yokosuka Arsenal & Armaments Works	Large, important	35°17'N 139°41'E	"
			35°16'N 139°39'E	"

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - NAVAL BASES AND SHIPYARDS

DIGEST NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET GROUP NO.
	TOKYO (90.17) (Continued)			
295	Yokosuka Air Station Oil Tanks	Surface tanks	35°17'N 139°39'E	N A
296	Mine & Aircraft Stores	Large & important	35°13'N 139°39'E	"
297	Mako Point Oil Tanks (Yokosuka)	Surface & underground tanks	35°18'N 139°39'E	"
298	Yokosuka Naval Air Station	(See Airports)	35°19'N 139°39'E	"
1392	Naval Aircraft Factory & Research Center	Key naval air experimental center	35°19'N 139°38'E	"
1452	Base Headquarters	Includes residence C-in-C	35°17'N 139°40'E	"
1453	Gunnery & Navigation Schools	Training center	35°18'N 139°40'E	"
1454	Honare Drydock	Large, new drydock	35°18'N 139°40'E	"
1455	Oyama Point Ammunition & Powder Stores	Large	35°18'N 139°39'E	"
1456	Torpedo & Wireless School	Important source fleet personnel	35°19'N 139°39'E	"
1457	Nontonaga Inlet Oil Tanks (Yokosuka)	7 or more oil tanks	35°18'N 139°39'E	"
1458	Yokosuka Naval Radio	Range 1500-2000 nautical miles	35°17'N 139°39'E	"
1486	Old Aircraft Center	Supplements #1392	35°18'N 139°38'E	"
	SHIPYARDS			
69	Yokohama Dockyard Mitsubishi Heavy Industries	One of largest in Japan	35°27'N 139°38'E	N A
70	Asano Dockyard (Yokohama)	Almost entirely a repair yard	35°28'N 139°39'E	"
71	Uraga Dockyard #3 (Yokohama)	Small branch of Uraga Shipbuilding Yard	35°27'N 139°38'E	"
122	Tsurumi Steel & Shipbuilding (Yokohama)	Ocean-going tankers, other ships; rptd also cruisers	35°29'N 139°42'E	"
274	Shipyard of Yokosuka Naval Base	Very important; among largest yards in Japan	35°17'N 139°40'E	"
330	Ishikawajima Dockyard Ishikawajima Shipbldg & Engineering	Important engineering works, shipbuilding yard	35°40'N 139°47'E	"

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JAPAN - NAVAL BASES AND SHIPYARDS

Index No.	Name	Content	Approximate Coordinates	Chart No.
	TOKYO (90.17) (Continued)			
1459	Suzuki Uyed Ishikawajima Shipbldg & Engineering	At least one 20,000-ton drydock, 3-4 bldg slips, contracts	35°39'N 139°48'E	N A
1460	Uraga Dockyard #1 (Yokosuka)	Can build all types naval vessels up to large cruisers	35°15'N 139°43'E	"
1461	Uraga Dockyard #2 (Yokosuka)	Integrated operation with Dockyard #1	35°15'N 139°43'E	"
1462	Shinagawa Shipyard (Tokyo)	Repairs merchant ships; 4 ways, 3000-ton drydock	35°36'N 139°45'E	"
	SHIMIZU (90.32)			
1185	Shipyard (Shimizu)	Minor shipyard	35°00'N 138°31'E	1176
	MAIZURU (90.33)			
037-1043	Maizuru Naval Base	Lgtd 4th largest in Japan	35°29'N 135°22'E	1039
	OSAKA (90.34)			
1216	Tobu Dockyard	Builds small fishing & coastwise boats	34°38'N 136°51'E	1215
	KOBE (90.35)			
169	Mitsubishi Dockyard	Important; building & repair, capital ships	34°39'N 135°11'E	10
171	Kawasaki Dockyard Co	Important; can build capital ships	34°40'N 135°11'E	10
272	Casks Iron Works Unit #1	Important; can build ships of 12,000-ton class	34°40'N 135°27'E	263
273	Mujinogata Shipyard	Light cruisers, destroyers, submarines	34°37'N 135°28'E	325
699	Casks Iron Works Unit #2	Operates in conjunction #272	34°39'N 135°28'E	325

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Detail - Inland Japan Key Shipyards

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET GRID NO.
	OSAKA (90.27)			
1295	Mitsui Tama Shipyard	Major shipyard	34°28'N 133°56'E	1295
1296	Harima Shipyard	Rptd more than 10% commercial shipbuilding	34°47'N 134°28'E	1296
	HIROSHIMA (90.29)			
927-a	Mabu Works of Osaka Iron Works Innoshima Shipyards	One of largest repair yards, also bldg	34°16'N 133°11'E	927-a
927-b	Shannosho Works of Osaka Iron Works Innoshima Shipyards		34°16'N 133°11'E	927-a
928	Mukaishima Drydock Co	Repairs, possibly some bldg	34°24'N 133°13'E	928
929	Mihara Shipyards	Rptd new yard, no details	34°23'N 133°05'E	933
930	Saizaki Dockyard	Rptd new yard, no details	34°20'N 133°02'E	None
	KURE (90.30)			
657-b	Kure Naval Shipyard	Largest in Japan	34°14'N 132°33'E	657
	TOKUYAMA (90.32)			
668	Kasado Jima Dock Co & Osaka Iron Works	2 docks & at least 2 drydocks	33°57'N 131°51'E	672

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	CONTENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIKOKU-KYUSHU (90.34)			
43-a	Hiko 1 Shipyards & Engine Works	Important; patrol boats, repairs ships to 6,000 tons	33°56'N 130°56'E	43-a
43-b	Osaka Iron Works Drydocks	Important ship repair	33°56'N 130°56'E	43-a
558	Tochigi Shipbuilding Yards	Rptd secondary but expanding	33°55'N 130°49'E	29
	SASEBO (90.36)			
542	Akunoura Engine Works (Nagasaki)	Very important, marine engine production	32°44'N 129°52'E	542
543	Mitsubishi Dockyard (Nagasaki)	Important repair dockyard	32°44'N 129°52'E	544
544	Mitsubishi Shipyard (Nagasaki)	Very important naval & commercial shipbuilding	32°44'N 129°52'E	544
752	Sasebo Naval Dockyard	Very important; bldg, principal navy repair base	33°10'N 129°42'E	752
808	Natsuo Engine Works (Nagasaki)	Secondary, marine engine production	32°45'N 129°52'E	542
860	Meyagi Shima Shipyard, Natsuo Iron Works	Secondary shipbuilding	32°42'N 129°49'E	542
	JAPANESE PACIFIC ISLANDS (91)			
	TAIHOKU (91.3)			
15-b	Cyucho Harbor Dockyard, Taiwan Dockyard Co	Important; only large dockyard in Taiwan	25°09'N 121°44'E	15-a
23	Shonyo To Shipyard	Small shipyard	25°10'N 121°45'E	15-a
24	Heelung Submarine Base	Rptd converted to submarine base	25°09'N 121°45'E	15-a

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	GROUP NO.
	TAIHO (21.6)			
7	Kiro Naval Dockyard (Takao)	Only shipyard southern Taiwan	22°37'N 120°16'E	7
56	Toshien Dockyard (Toshien)	New yard, size not known	22°41'N 120°16'E	56
	HOKO/PORES (21.7)			
145-147, 149-153, 156,158	Amsan Naval Base	Key to naval defense of Taiwan	23°33'N 119°34'E	148
148	Kotei Naval Anchorage	Cruisers, submarine, motor-torpedo boat base	23°35'N 119°38'E	148
	CHOSEN (84)			
	GENZAN (84.4)			
87	Genzan Submarine Base	New submarine base	39°12'N 127°29'E	88
	FUSAN (84.7)			
101	Chinkai Naval Base	Fleet anchorage, minor naval sta, mine base	35°09'N 128°38'E	101
102	Chinkai Naval Shipyard	Small ships, minor repairs to destroyer class	35°09'N 128°38'E	101

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MANCHUKUO (93)			
	DAIREN (93.5)			
10	Manchuria Dockyard Co	Most important dockyard in Manchukuo	38°56'N 121°39'E	1
11	Naval Dockyard	2 graving docks; one building slip	38°48'N 121°16'E	11
	CHINA (83)			
	CANTON (83.4)			
53	Taikoo Dockyard	Large yd, drydock, slipways, all repairs	22°17'N 114°13'E	55
54	Royal Navy Yard	Small but modern & well equipped	22°17'N 114°10'E	55
55	Kowloon Dockyard	Large yd, builds ships to 10,000 tons, repairs	22°18'N 114°10'E	55
56	Cosmopolitan Dock	Large, all types repairs, builds medium freighters	22°19'N 114°10'E	55
57	Aberdeen Dock	Small	22°17'N 114°09'E	55
	HAINAN (83.6)			
33	Yulinkan Harbor Naval Base	Important submarine base	18°13'N 109°32'E	33
	TSINGTAO (83.11)			
93	Drydock (Tsingtao)	Can handle destroyers; repairs	36°04'N 120°18'E	78
94	Jap Naval Repair Shop (Tsingtao)	Small navy yard	36°05'N 120°19'E	78

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	CONTENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TIENTSIN (93.12)			
2	Taku Tug & Lighterage Co (Taku)	Important; repairs, concentration tugs, lighters	39°00'N 117°42'E	4
6	Chinese Naval Dockyard (Taku)	Repairs for local shipping	38°59'N 117°40'E	4
20	Hai Ho Conservancy Board Dockyard (Tientsin)	Harbor maintenance equipment	39°06'N 117°13'E	11
29	Tientsin Lighter Co (Taku)	Important; repairs, concentration tugs, lighters	39°00'N 117°41'E	4
	THAILAND (98)			
	THAILAND (98.1, 98.2, 98.3)			
53	Bangkok Dock Co	Chief commercial ship repairs in Bangkok	13°43'N 100°31'E	26
54	Ministry of Marine Compound	Naval dockyard, machine shops; fortified	13°45'N 100°29'E	26
55	Fort Chulachomklao (Bangkok)	Rptd main fort, also drydocks, workshops	13°32'N 100°35'E	55
56	Royal Irrigation Dept	Repairs large diesel dredgers	13°47'N 100°31'E	26
57	Satchib Naval Base	Rptd new main naval base of Thai Navy	12°40'N 100°53'E	12
	BRITISH MALAYA (92)			
	SINGAPORE (92.2)			
15-23	Singapore Naval Base	Very important; see targets below	01°28'N 103°50'E	

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	CHART
	SINGAPORE (92.2) (Continued)			
15	Shell Oil Co Facilities	Storage & fueling jetty	01°27'N 103°46'E	17
16	Ammunition Depot Jetty Area	Military stores; jetty	01°23'N 103°48'E	17
17	Fourth Senoko Oil Depot	Rptd 30 tanks 3,275,000 bbls capacity	01°27'N 103°48'E	17
18	Naval Base Radio Station	Powerful; overseas communication	01°23'N 103°40'E	17
19	Sembawang River Area	Piers, warehouses, cement plant	01°28'N 103°40'E	17
20	Drydock and West Wall Area	1000 ft carrying dock, large berthing space, cranes	01°26'N 103°50'E	17
21	Workshop Area	Shops for all repairs to largest ships	01°23'N 103°50'E	17
22	North Wharf Area	2200 ft dock, 50,000 ton & 5000 ton floating drydocks	01°23'N 103°50'E	17
23	Naval Stores Basin Area	Large basin, warehouses	01°22'N 103°52'E	17
51	Tandjong Rhu Shipyards	Three shipyards for bldg, repairing small ships	01°18'N 103°52'E	52
	BURMA (82)			
	BURMA SOUTH (82.2)			
14	Dalla Dockyard (Rangoon)	Repairs some ocean ships, builds river boats	16°46'N 96°10'E	14
15	Ahlone Foundry (Rangoon)	Castings for river boats	16°47'N 96°08'E	14
16	Pazundaung Foundry (Rangoon)	Rptd expanded by Japs for truck repair	16°46'N 96°11'E	14

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JALAH - NAVAL BASES AND SHIPYARDS

Page No.	Place	Comment	Approximate Coordinates	Chart Chart No.
	PHILIPPINES (96)			
	PALAU ISLANDS GROUP (96.1)			
	PALAU ISLANDS SOUTH (96.2)			
19	Cavite	Naval base restored by enemy	14°20'N 120°54'E	NA
33	Philippine Slipways	Small wooden boat construction	14°35'N 120°59'E	"
34	Varadero Slipways	Small wooden boat construction	14°35'N 120°59'E	"

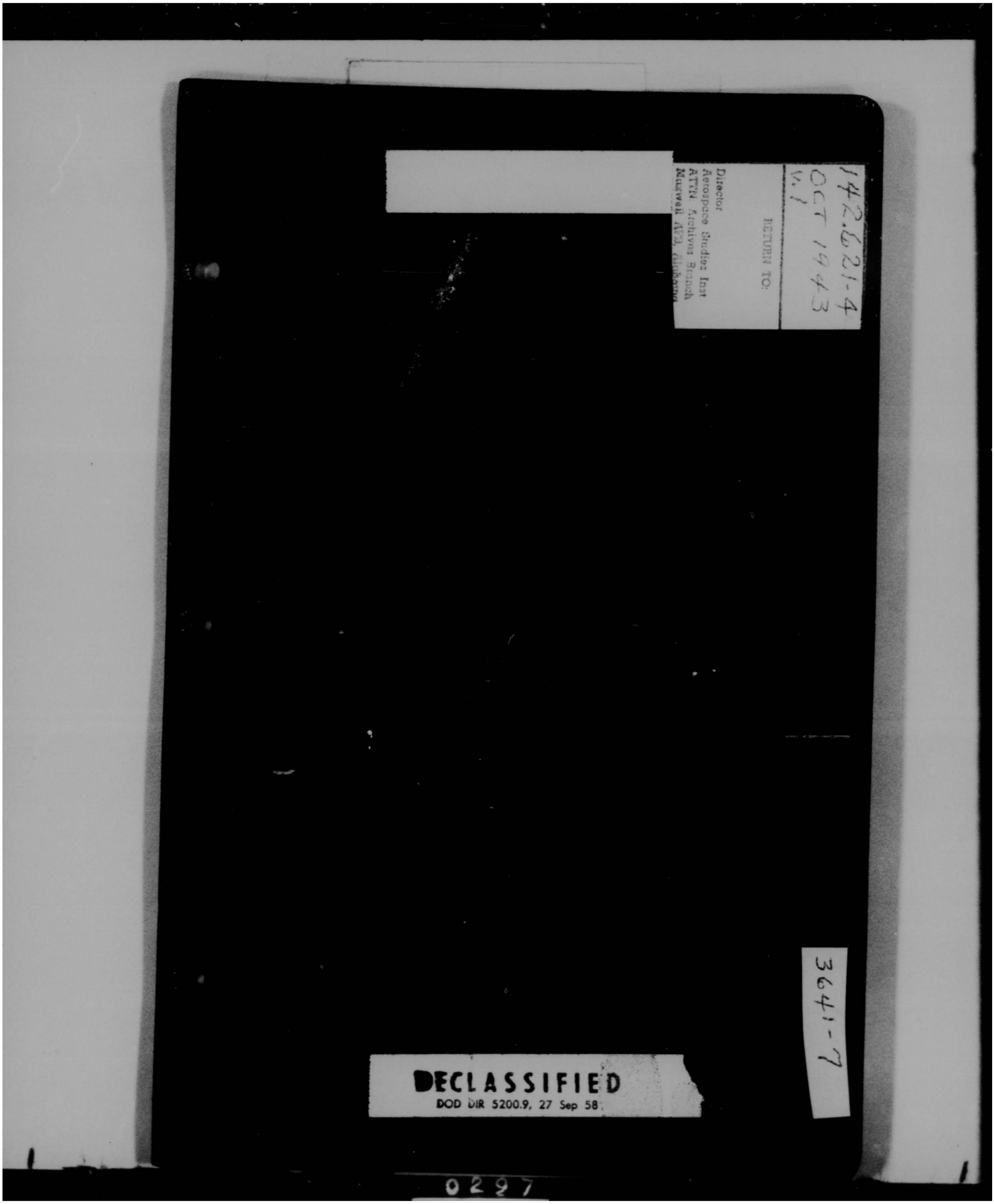
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I. Directive

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SUBJECT: Incendiary Study to Supplement "Japanese Target Data - March 1943"

Date: May 10, 1943

Comment No. 1

TO : Asst. CAS, Intelligence

FROM : Asst. CAS, Plans

AW/lay/5835

1. As an addendum to "Japanese Target Data - March 1943", and without duplication or recapitulation of data therein contained, it is requested that your office prepare a study of the vulnerability of Japanese target areas to incendiary attack.

2. It is desired that the areas selected include, or be in the immediate vicinity of, legitimate military targets, as classified and discussed in the basic study; and that the supplementary study include:

(a) The inflammability characteristics of the structure in the areas, for reference in determining the extent to which incendiary attack would be effective, and the types of incendiary bombs or other air-borne weapons which should be used.

(b) The effect which incendiary destruction of each area would have on the military objectives situated therein, or adjacent thereto.

(c) Request that the same distribution be made as was given to the original study.

(d) In connection with the development of this study, liaison with this office be maintained through Colonel Adrian Williamson, W.D. Extension 5835, Room 3E-1086 Pentagon Building.

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/s/ O. A. ANDERSON
Brigadier General, U. S. A.

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II. Answering Memorandum

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15 October 1943

MEMORANDUM FOR BRIGADIER GENERAL L. S. KUTER

Subject: Japan, Incendiary Attack Data

1. Pursuant to a directive from Brigadier General O. A. Anderson, dated May 10, 1943, this study considers the vulnerability of Japanese target areas to incendiary attack.

2. This study deals with incendiary bombing of selected zones in twenty (20) Japanese cities. It describes the layout and construction of Japanese cities and indicates their general suitability for incendiary attack. A detailed analysis of the combustible nature of the vulnerable zones in these cities is used as the basis for a discussion of a general pattern of incendiary attack. Finally, an estimate is made of the damage to Japan's war economy which may be accomplished by attacks of this type.

3. Several estimates made in this study are based on test data concerning the AN-M69 bomb and are subject to modification in the light of operational experience and/or the development of new munitions. The conclusions reached in this study are necessarily tentative; additional material on this subject will be submitted as it becomes available.

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For the Commanding General, Army Air Forces

WILLIAM C. BENTLEY,
Colonel, G. S. C.
Acting Deputy Asst Chief of Air Staff,
Intelligence

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CHAS. C. SMITH CO. OMAHA, NEBR. U. S. A.
REVISED

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IV. Report

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JAPAN - INCENDIARY ATTACK DATA

Report

1. As targets for incendiary attack, key Japanese cities offer the following significant advantages over comparable German cities:

(a) Japanese residential construction is much more inflammable and would be more easily ignited by incendiaries than that of Germany.

(b) Japanese cities are more congested and correspondingly more susceptible to conflagration than German cities.

(c) Factories and military objectives in Japanese cities are more often surrounded by residential congestion and are more exposed to sweeping fires than they are in Germany.

(d) Japan's war industry is more highly concentrated in a few key cities than is that of Germany.

2. Tests indicate that one ton of incendiaries of the AN-M69 type will start 55 to 140 fires (depending on roof coverage) beyond the control of household or ARP equipment in vulnerable sections of Japanese cities. It is estimated that a total of 30 tons in a concentrated pattern will (under average weather conditions) so overwhelm the professional fire departments in even the largest cities that they will be unable to control the fires within a bomb pattern area approximately 5 square miles in size.

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On this basis, tonnages ranging from 10 tons for Nagasaki to 631 tons for Tokyo are the estimated requirements for setting conflagrations which will destroy factories and military objectives over wide areas and indirectly reduce war production by dehousing workers and disrupting essential services. The total requirement for twenty key cities is 1690 tons. These tonnages are the concentrations required within the limits of the vulnerable zones to effect complete destruction of these zones. They do not provide for operational factors involved in accomplishing the required concentrations. Tonnage requirements for each city are summarized in Table I.

3. Twenty key cities are analyzed in this study and detailed zone maps are included for ten of these. Three zones are indicated for each city:

Zone I — most vulnerable; includes the commercial center and the inner, congested residential districts.

Zone II — includes less congested residential areas, dock and warehouse districts and mixed industrial/residential sections.

Zone III — a non-incendiary zone, covers open spaces, and sparsely settled, outlying sections which are not considered profitable for incendiary attack. Targets in this zone would be indirectly rather than directly affected.

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4. The twenty cities have a total population of 16,600,000 (1940), or 22% of the total national population. They contain 53% of all numbered targets, 69% of all Key Targets, and 74% of all Priority Targets as listed for Japan Proper in "Japanese Target Data - March 1943". It is estimated that the indicated attacks against these twenty cities would have the following results:

a. Destroy 136 of these listed targets, including 9 Key Targets. Of these, 83 are industrial production units, 38 are major storage installations, 9 are transportation facilities and 5 are miscellaneous targets. These comprise 24% of all the targets listed in the twenty cities, or 13% of all targets in Japan Proper.

b. Reduce the output of 267 additional factory targets, including 79 Key Targets, as a result of indirect effects on workers, transportation, etc. These comprise 47% of all targets listed in the twenty cities, or 25% of all targets in Japan. More important, these include 52% of all the Key Targets in Japan Proper.

c. Destroy thousands of small factories, not listed as specific targets, including over 20,000 in the three largest cities alone. These small plants are much more important in Japan than in other major industrial nations.

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d. Render homeless approximately 12,000,000 persons, or 71% of the total population of the twenty cities, and destroy stocks of food, clothing, etc.

e. Disrupt public utilities and essential public services in these cities.

f. Destroy finished military goods and essential materials in embarkation depots and other storages.

The effects on listed targets in each of the twenty cities are indicated in Tables II and III. Part VIII describes the industrial importance and vulnerable zones of ten cities, and indicates the significance and vulnerability of the individual targets therein.

5. Considering the number and importance of the factories covered in (a) and (b) above, and the aggregate significance of the thousands of small factories affected, it is estimated that the total production loss would be of the order of 30%. The period of recuperation would vary with the type of installation concerned, but the over-all loss may be estimated as extending from four to six months.

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TABLE I

Summary of Incendiary Bombing Data for Twenty Cities

City	Total City Population	Area of Vulnerable Zones (Square Miles) I	II	Total	Total Tons of Incendiary Bombs (for average weather) I	II	Total
Tokyo	6,779,000	10.9	56.6	67.5	65	566	631
Yokohama	968,000	1.0	6.4	7.4	6	64	70
Kawasaki	301,000	2.3	2.3	4.6	14	23	37
Yokosuka [1]	193,000	0.5	1.6	2.1	3	16	19
Osaka	3,252,000	11.2	28.2	39.4	67	282	349
Kobe	967,000	3.6	6.7	10.3	22	67	89
Amagasaki [1]	181,000	0.5	1.5	2.0	3	15	18
Nagoya	1,328,000	5.6	15.2	20.8	34	152	186
Hiroshima	344,000	1.6	4.3	6.1	11	43	54
Kure [1]	276,000	0.7	2.3	3.0	7	23	30
Niigata [1]	151,000	0.4	1.3	1.7	2	13	15
Yawata [3]	434,000	2.0	2.5	4.5	12	25	37
Fukuoka	323,000	1.3	4.1	5.4	8	41	49
Nagasaki	253,000	0.9	0.5	1.4	5	5	10
Sasebo [1]	206,000	0.6	1.7	2.3	3	17	20
Kokura [1]	179,000	0.5	1.5	2.0	3	15	18
Omuta [1]	177,000	0.5	1.5	2.0	3	15	18
Moji [1]	139,000	0.4	1.2	1.6	2	12	14
Kurume [1,2]	90,000	0.2	0.8	1.0	2	12	14
Nobeoka [1,2]	79,000	0.2	0.7	0.9	2	10	12
TOTALS	16,620,000	45.1	140.9	186.0	274	1416	1690

1: Data estimated using indices given in Table IV and discussed in text.
2: Tonnage of bombs increased by 50% on account of small area of city.
3: Includes Tobata, Wakamatsu and Kurosaki.

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TABLE II

EFFECTS ON SELECTED TARGETS OF GENERAL CONFLAGRATIONS IN ZONES I AND II OF TWENTY JAPANESE CITIES

Cities	Total Selected Targets in 20 Cities			Effects on Selected Targets of Conflagrations in Zones I & II of 20 Cities											
	Total Targets	Key Targets	Priority Targets	ZONE I A	ZONE I B	ZONE I C	ZONE II A	ZONE II B	ZONE II C	ZONE III B	ZONE III C	Total A	Total B	Total C
TOKYO BAY AREA														
Tokyo	120	23	2	4		1	25 (3)	35 (8)	16 (4)	23 (7)	16 (1)	29 (3)	58 (15)	33 (5)
Yokohama	53	9	3				14 (1)	7 (2)	7 (1)	13 (5)	12	14 (1)	20 (7)	19 (1)
Kawasaki	50	15	3	3	3 (2)	2		1 (1)		25 (8)	16 (4)	3	29 (11)	18 (4)
Yokosuka	18	2	1			1				7 (2)	10		7 (2)	11
OSAKA BAY AREA														
Osaka	81	13	1	12	2	2 (2)	18 (1)	17 (2)	3 (1)	21 (6)	6 (1)	30 (1)	40 (8)	11 (4)
Kobe	36	10	7	9 (1)	2 (1)		9	12 (5)	2 (1)	2 (2)		18 (1)	16 (8)	2 (1)
Amagasaki	9	3					1	1		5 (1)	2 (2)	1	6 (1)	2 (2)
ISOLATED CITIES ON HONSHU ISLAND														
Nagoya	42	10	2	3	1		8 (3)	8 (3)	1	10 (3)	11 (1)	11 (3)	19 (6)	12 (1)
Hiroshima	15					3	6		2		4	6		9
Kure	7	1	1				1			4 (1)	2	1	4 (1)	2
Niigata	29	1	1	1	1 (1)		6	4		7	10	7	12 (1)	10
ISOLATED CITIES ON KYUSHU ISLAND														
Yawata 1/	19	4	3					6	3	9 (4)	1		15 (4)	4
Fukuoka	10			4						2	4	4	2	4
Nagasaki	20	3	2	2			2	6 (2)	2	1 (1)	7	4	7 (3)	9
Sasebo	12	2	1	1			1	2		3 (2)	5	2	5 (2)	5
Kokura	13	3		1			1	1 (1)	2	6 (2)	3	1	7 (3)	5
Omuta	15	5	1				1	2		9 (5)	3	1	11 (5)	3
Moji	5						2	2			1	2	2	1
Kurume	6	1	1				1			3 (1)	2	1	3 (1)	2
Nobeoka	5	1					1	1		3 (1)		1	4 (1)	
TOTALS	565	106	29	39 (1)	9 (4)	9 (2)	97 (8)	105 (24)	38 (7)	153 (51)	115 (9)	136 (9)	267 (79)	162 (18)
Percent of Total in Twenty Cities	100%	100%	100%									24% (8%)	47% (75%)	29% (17%)
Percent of Total in all of Japan proper (1059 total targets, 153 Key, 39 Priority)	53%	69%	74%									13% (6%)	25% (52%)	15% (12%)

Source : Selected targets compiled from Japanese Target Data, March 1943. Estimates of vulnerability made by Mr. Boris Laising and Dr. H. H. Ewell, in consultation with Mr. N. J. Thompson.

Explanation of Symbols :

"A" - Targets probably destroyed or seriously damaged by a general conflagration.
"B" - Targets probably not seriously damaged, but production reduced by indirect effects.
"C" - Targets neither seriously damaged nor affected by indirect effects.

Key Targets are shown in parentheses. (Priority Targets are included in total of Key Targets.) For definition of Key and Priority Targets see Japanese Target Data, March 1943.

1/ Includes adjoining towns of Tobata, Wakamatsu and Kurosaki.

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TABLE III

Breakdown of Damage Data from Table II into Six Categories of Targets

Type of Objective	Total Targets in Japan	Effect On Targets In 20 Cities		Percent of Total of Each Type In Japan Proper	
		A	B	A	B
INDUSTRY: All types of production facilities, plus major maintenance and repair facilities. Includes direct & indirect military production.	552	83	267	15%	48%
STORAGE: Military and civilian goods in permanent or temporary storage. Includes oil storages and ordnance depots.	132	38	-	29%	-
TRANSPORTATION: All types of transportation objectives, except (1) freight yards and cargo wharves (under Storage) and (2) R.R. Shops (under Industrial).	98	9	-	9%	-
POWER: All steam and hydro-electric plants and sub-stations.	110	-	-	-	-
DEFENSES: Includes H.Q., barracks, fortifications and airfields.	104	-	-	-	-
MISCELLANEOUS: Radio stations, telephone exchanges, gas works, water works, food markets, technical schools, experimental laboratories, mines, and public buildings.	63	5	-	8%	-
TOTALS	1059	136	267	-	-
Percent of all types of targets in Japan Proper		13%	25%		

Source: Targets compiled from Japanese Target Data, March 1943

Explanation of Symbols :

A - Targets probably destroyed or seriously damaged by a general conflagration.

B - Targets probably not seriously damaged, but production reduced by indirect effects.

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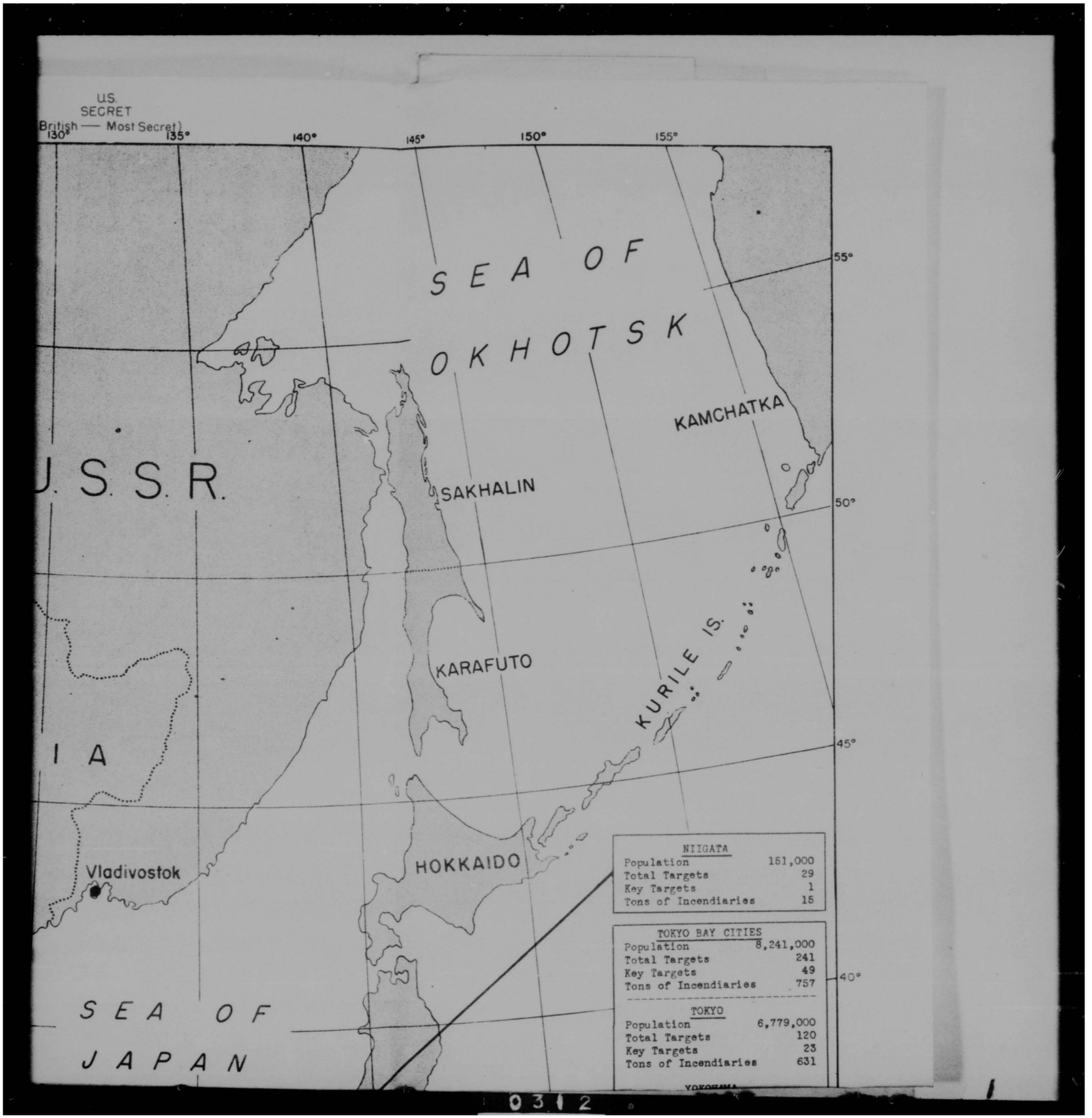
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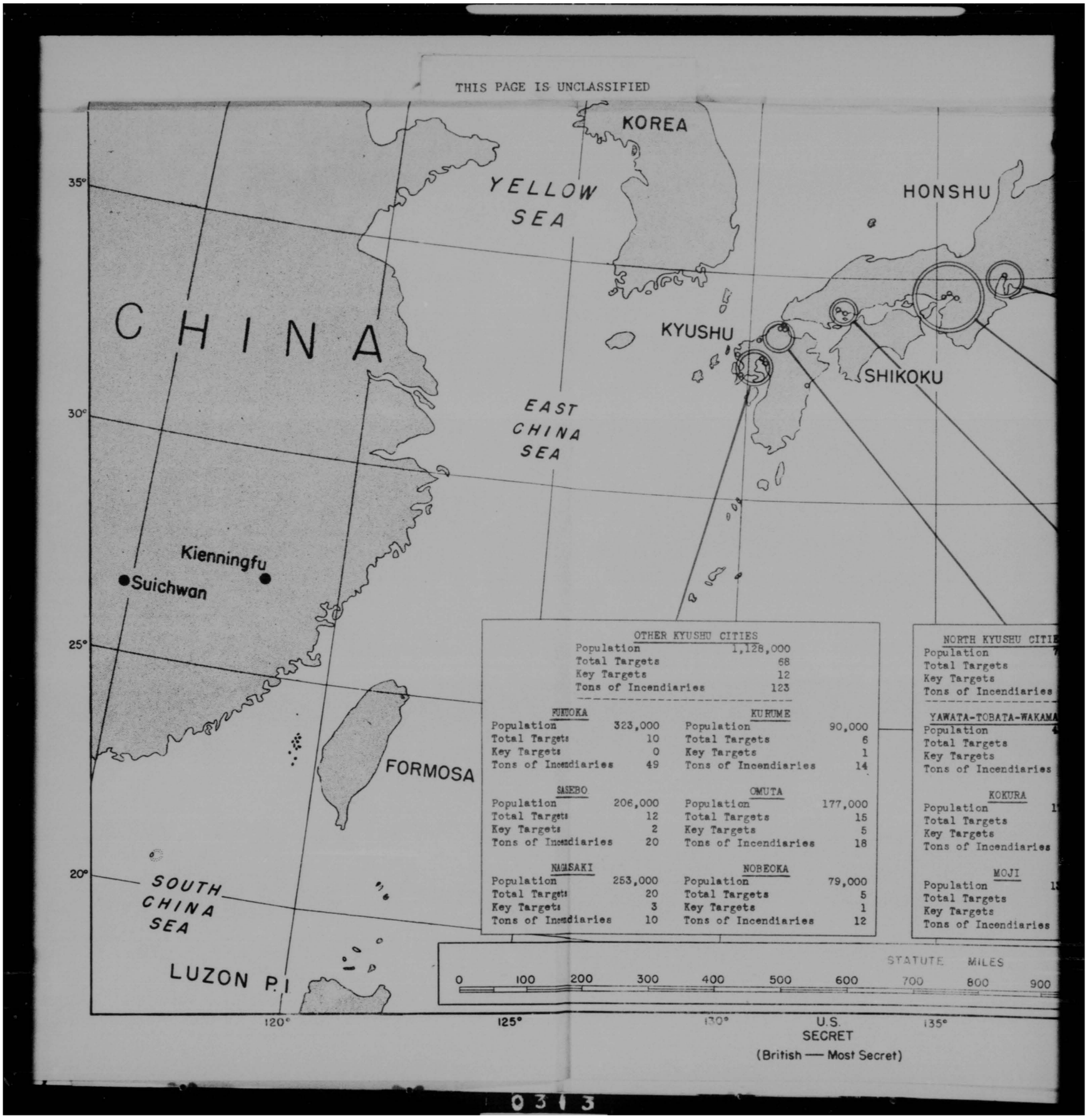
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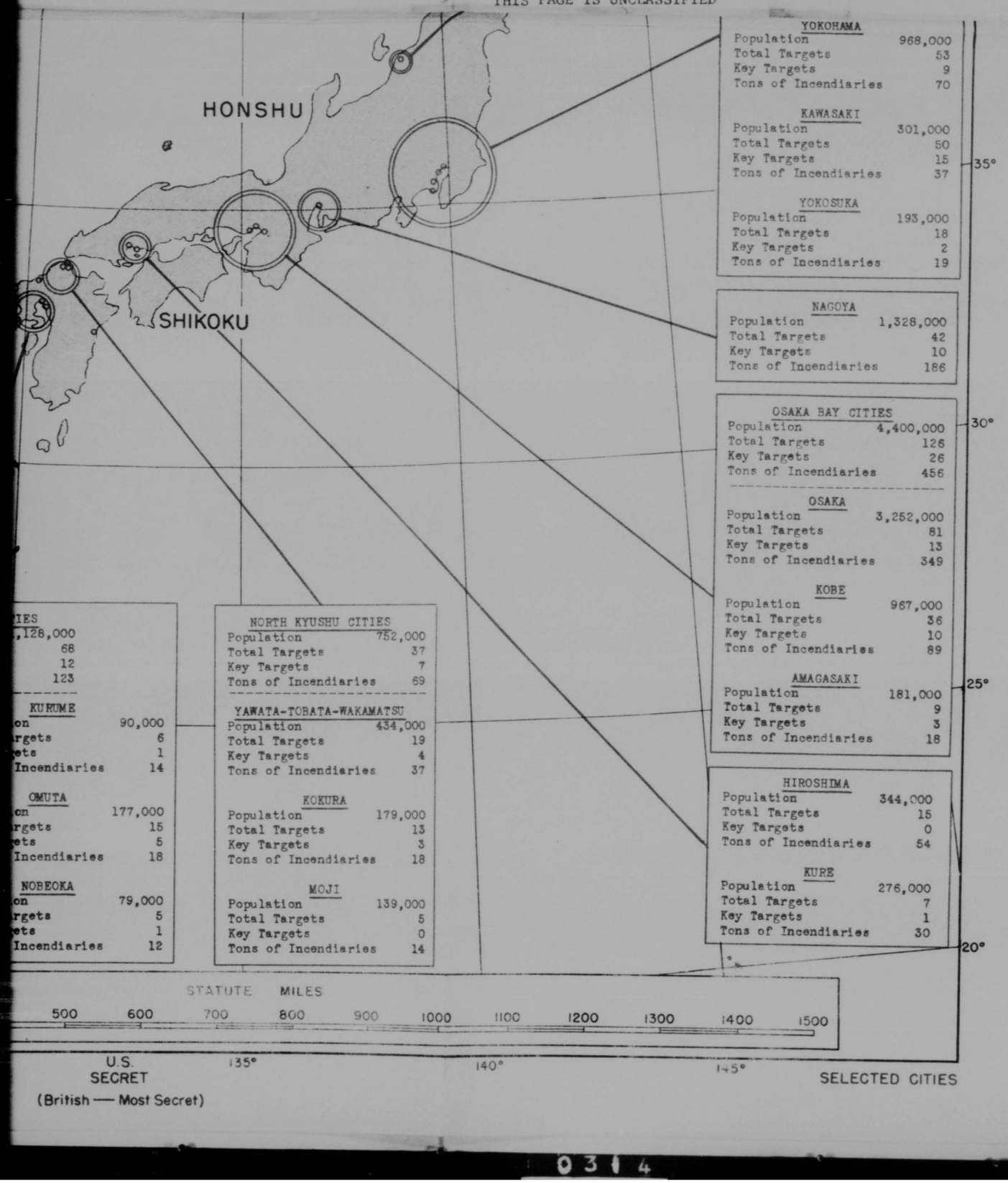
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YOKOHAMA
Population 968,000
Total Targets 53
Key Targets 9
Tons of Incendiaries 70

KAWASAKI
Population 301,000
Total Targets 50
Key Targets 15
Tons of Incendiaries 37

YOKOSUKA
Population 193,000
Total Targets 18
Key Targets 2
Tons of Incendiaries 19

NAGOYA
Population 1,328,000
Total Targets 42
Key Targets 10
Tons of Incendiaries 186

OSAKA BAY CITIES
Population 4,400,000
Total Targets 126
Key Targets 26
Tons of Incendiaries 456

OSAKA
Population 3,252,000
Total Targets 81
Key Targets 13
Tons of Incendiaries 349

KOBE
Population 967,000
Total Targets 36
Key Targets 10
Tons of Incendiaries 89

AMAGASAKI
Population 181,000
Total Targets 9
Key Targets 3
Tons of Incendiaries 18

HIROSHIMA
Population 344,000
Total Targets 15
Key Targets 0
Tons of Incendiaries 54

KURE
Population 276,000
Total Targets 7
Key Targets 1
Tons of Incendiaries 30

NORTH KYUSHU CITIES
Population 752,000
Total Targets 37
Key Targets 7
Tons of Incendiaries 69

YAWATA-TOBATA-WAKAMATSU
Population 434,000
Total Targets 19
Key Targets 4
Tons of Incendiaries 37

KOKURA
Population 179,000
Total Targets 13
Key Targets 3
Tons of Incendiaries 18

MOJI
Population 139,000
Total Targets 5
Key Targets 0
Tons of Incendiaries 14

TIES
,128,000
68
12
123

KURUME
on 90,000
rgets 6
ets 1
Incendiaries 14

OMUTA
on 177,000
rgets 15
ets 5
Incendiaries 18

NOBEOKA
on 79,000
rgets 5
ets 1
Incendiaries 12

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CHARACTERISTICS OF JAPANESE CITIES

The mountainous hinterland of the Japanese main islands has confined most large cities to the coastal fringe. As a result, most Japanese cities of over 100,000 population are located on or very near the coast, a fact of significance for incendiary bombing because it aids identification and exposes them to daily land-sea winds.

As seen from the air, the striking aspect of large Japanese cities is the virtually solid mass of one and two story houses, with only a relatively small proportion of multi-storied modern buildings. Despite building regulations and zoning laws which have been in effect since the great earthquake and fire of 1923, the bulk of the area of most Japanese cities continues to be greatly congested with predominantly wooden structures.

Layout of Cities *

As in western cities, the hub of the Japanese city is the commercial center. Here are concentrated most of the multi-storied, fire-resistive buildings, although only in Tokyo and Yokohama are there any sizeable blocks of such structures. In other cities these fire-resistive buildings are interspersed among predominantly wooden dwellings. In many cities, particularly those having a population of 200,000-400,000, the commercial buildings are usually located along one or two main streets, adjoining masses of low, frame houses.

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Surrounding the central business district are congested low-class residential sections, many of them having a population density in excess of 100,000 per square mile. Over 90% of the dwellings located here are of wooden construction, making these areas susceptible to sweeping conflagrations. Very few large factories are located in these inner residential districts, but there are numerous small factories and household industries.

Surrounding the central congested sections of the city are less congested middle-class residential areas, mixed residential/industrial areas and purely industrial areas. The less congested residential areas taper off gradually from the congested center out to the sparsely built-up suburbs. Much of this type of area is still vulnerable to sweeping fires -- more so, in fact, than most central districts in German cities. The mixed residential/industrial districts are especially good incendiary targets, since factories of all sizes are located here in close proximity to densely-clustered workers' homes and, therefore, are exposed to conflagrations. Such districts comprise relatively large portions of Tokyo, Osaka, Nagoya and Kobe. (See Figures 11 and 13 in "Incendiary Zones of Japanese Cities").

The purely industrial districts (usually located on the waterfront or along rivers, canals or railway lines in outlying parts of the city) are characterized by fairly modern, fire-resistive factory structures, separated from large masses of dwellings. Also located along the waterfront or along rivers or canals are the dock and warehouse districts.

Following the great earthquake and fire of 1923, the Japanese instituted several fire-prevention zoning laws aimed at establishing wide streets and park areas in the large cities to act as firebreaks.

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* See enclosure "Incendiary Zones in Japanese Cities" for illustrative data to supplement this section.

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This program was partially accomplished in some cities, notably Tokyo and Yokohama, but the conflagration hazard in most cities was little affected. The distribution of street widths in Tokyo in 1935 is illustrated by the following figures: 31/

Percent of Total Length of Streets	Width
1.5%	88-235 feet
13.5%	23- 69 feet
85.0%	Less than 18 feet

Streets of 100 feet or more in width may act as firebreaks in a conflagration under average weather conditions, but streets of this width are spaced at relatively wide intervals -- about 1000 feet in some sections and 2500 feet or more in other sections. A study based on a large number of measurements on city plan maps of Tokyo, Osaka, Nagoya and Kobe leads to the following generalizations representing average street spacings in these four cities:

Street Width	Intervals
100 feet or more	Every 1500 feet
50-70 feet	" 750 "
20-35 feet	" 250 "
6-15 ft. (alleys)	At lesser distances

In addition to wide streets; canals, rivers and parks can also act as firebreaks. Many large Japanese cities are cut up by numerous canals, although only those in Tokyo and Osaka are sufficiently extensive as to be considered major firebreaks. Most canals are so narrow, and their banks so congested with wooden houses, warehouses, barges, etc., that their effectiveness as firebreaks is neutralized. Many cities are also dissected by one or more rivers which are usually wide enough to act as firebreaks. Parks are an important factor only in Tokyo; in most other cities they can be largely ignored because they are either too small or they are not located in congested districts.

Construction of Japanese Buildings

From the point of view of incendiary bombing, the most significant feature of Japanese cities is their high percentage of wooden buildings. One report states that the distribution of construction in Tokyo (1937) was as follows: 37/

One-story buildings, wood and adobe	609,309	59.1%
Two-story buildings, mainly wood and adobe	412,174	40.0%
Three or more stories, various construction	9,312	0.9%

Another report states that the percentage of wooden buildings in Tokyo varies from a minimum of 91% in the modernized sections to a maximum of 99% in many parts of the city, with an average of 98% for the whole city. 4/ Analogous figures for Nagoya (1938) are the following: 37/

Wooden buildings	315,402	96.5%
Brick and concrete buildings	661	0.2%
Other constructions (?)	10,638	3.3%

37/ See reference number 37 in Bibliography. All numbered references in this study refer to Bibliography.

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These data are believed to apply generally to other Japanese cities. There are two principal types of roofs, (1) tile roofs which comprise about 70-80% of the roofs in typical cities and (2) sheet metal roofs which comprise about 10-20%. Both types of roofs are easily penetrated by small incendiary bombs. Other types of roofs comprise a small proportion of the total. Although the tile and metal roofing is easily penetrable, there are heavier members in the roofs, totalling about 11% of each roof area, which can stop small incendiary bombs.

The common construction of dwellings is of the column and beam type employing heavy wooden members but no load-bearing walls. Basements are not used; dwellings are raised about 18 inches off the ground on pillar supports. Permanent walls are used only on two sides (occasionally three sides); the other two sides are closed by translucent sliding paper screens (shoji) inside and sliding wooden or glazed shutters outside. The permanent walls are usually mud plaster (adobe) over a bamboo framework with an exterior of thin wood siding or adobe. Ceilings are of the "hung" type, of very light wood. The floors of all principal rooms are covered with 3 foot x 6 foot rice-straw mats (tatami). Heavy sliding paper screens (fusuma) are used as partitions between rooms. There is very little furniture, consisting of a few low tables, chests of drawers, sitting cushions and sleeping mattresses (stored in the daytime).

The exposed surfaces inside a Japanese house are, therefore, tatami mats; wooden walls, shutters and ceilings; paper screens; and the relatively few pieces of furniture. Outside the exposed surfaces are wood or glass shutters; wood siding and structural members or adobe and wood structural members; and tile or sheet metal roofing. The wood is unpainted, which increases the fire hazard somewhat. (For a more detailed description of Japanese residential construction, see reference #3, "Design and Construction of Typical German and Japanese Test Structures at Dugway Proving Ground, Utah.")

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Public buildings, schools, and office buildings are of western-type construction, adapted to withstand both fire and earthquake. They differ slightly from similar western structures in that the vertical supports are more substantial while horizontal supports (roofs and floors) are somewhat weaker. They are limited to about eight stories in height, or about 100 feet. Many are of reinforced concrete, others of brick or stone supported by steel frames. Cheaper mercantile buildings are constructed largely of wood and adobe, often hidden behind a brick or plaster front.

Construction of factories varies greatly according to the type of plant and its age. The newer and larger factories are similar to those in this country. Many are substantial fire-resistive structures, including reinforced concrete. Many medium sized factory buildings are constructed of wooden or steel frames covered with galvanized iron or asbestos sheeting. Due to the scarcity of steel, some of the newest munition plants are constructed largely of wood and asbestos sheeting. Most of the myriad small factories in the large industrial cities are built largely of wood and are essentially as inflammable as typical dwellings. The large warehouses are multi-storied, concrete structures, but the mass of smaller storehouses (godowns) are made of wood, galvanized iron or asbestos sheeting on steel frames or thick, fire-resistive adobe.

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Comparison of Japanese and German Cities

Table IV, on the following page, gives some pertinent comparative data between Japanese and German cities. All these factors point toward greatly enhanced effectiveness of incendiary bombing in Japanese cities as compared with German cities. Contrary to the usual concept, the population density in Japanese cities is only slightly greater than in German cities. However, since the buildings are higher in Germany, this means that the number of persons for a given floor area is much higher in Japanese cities.

The last two groups of data are significant from the point of view of strategic bombing. They show that both population and industry are more highly concentrated in a few large Japanese cities than they are in Germany. It is also notable that the relative percentages of population and of industry are about the same in the largest cities in Germany, whereas in Japan the concentration of industry in the largest cities is much higher than the concentration of population. The conclusion to be drawn from this is that in Germany the smaller cities and towns make a contribution to the nation's industry about in proportion to their populations, whereas in Japan industry is highly concentrated in a relatively few cities, and small cities and towns are proportionately not as important. However, it is known that attempts have been made recently to lessen this danger by decentralizing war industry.

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TABLE IV. COMPARISON OF JAPANESE AND GERMAN CITIES

	JAPAN	GERMANY
Percent of Buildings Easily Inflammable	Over 90%	Less than 10%
Roof Coverage in Central Section 1/	50-80%	35-60%
Residential Construction	Heavy beam framing. Interior surfaces & partitions are light wood, paper or straw mats. Exterior surfaces are wood or adobe. Roofs are tile or sheet metal.	Heavy beam framing. Interior surfaces & partitions are heavy wood or plaster. Exterior surfaces are brick or stone. Roofs are tile or slate.
Peacetime House Fires	Usually involve group of adjacent houses.	Usually confined to house of origin.
Conflagration Susceptibility	Conflagrations common in peacetime. Could be started by relatively light incendiary attacks.	Conflagrations unknown in peacetime. Have not been started by any except most concentrated incendiary attacks.
Industrial Construction	Large factories have similar construction features in both countries, but most small factories in Japan are more combustible than small German factories.	
Location of Factories in Cities	Same general pattern in both countries, with most large factories in outlying sections. However, a much higher percentage of smaller factories in Japan are located in congested parts of city proper.	
Street Width	Overall variation of street widths is same in both countries, varying from 6' alleys to boulevards over 100', but average street width is much lower in Japan.	
Average Height of Buildings in Central Sections	1½ stories	3-3½ stories
Population Density in Zones I & II 1/	63,000	55,000
Percent of City Population in Zones I & II	71%	49%
Sq. Miles of Zones I & II per 100,000 of Total City Population	1.12	0.90
Percent of National Population in:		
Largest City	9%	5%
2 Largest Cities	14%	8%
6 Largest Cities	20%	13%
Percent of National Industry in:		
Largest City	11%	6%
2 Largest Cities	19%	8%
6 Largest Cities	32%	14%

1/ See Part VI for derivation of these figures.

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GENERAL PRINCIPLES OF INCENDIARY ATTACK

While primarily an analysis of the vulnerability of Japanese cities to incendiary bombing, and of the damage to Japan's war potential which may result from such bombing, this study necessarily involves consideration of methods of incendiary attack.

This section deals with the bomb concentration -- in time and space -- required to (1) saturate the fire defenses and (2) create self-propagating fires or conflagrations.

The type of bomb concentration discussed herein is calculated to start sweeping fires in heavily built-up urban areas, utilizing the combustible materials in Japanese construction as "kindling" for conflagrations capable of destroying factories and other military objectives over wide areas. A plan of attack which appears to meet these requirements is outlined, but the basic conclusions of this study would obtain with any type of attack accomplishing the indicated bomb concentration.

The estimated tonnage requirements are based on (1) a detailed analysis of the combustible qualities of the vulnerable zones of selected cities and (2) extensive test data concerning the AN-M69 incendiary bomb. These tonnages represent the concentration of incendiaries which must be placed within the approximate limits of the vulnerable zones in order to insure their complete destruction. They incorporate a factor of safety which makes allowance for normal bomb dispersion along the limits of the target areas and for bombs landing in parks, rivers and other open spaces within the target areas. They do not, however, take into account operational considerations, inaccuracy of cluster placement, etc.

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These tonnage estimates are also subject to possible modification in the light of operational experience and/or the development of new munitions. According to available test data concerning AN-M69 incendiary bombs, the tonnages listed herein (if properly concentrated) are calculated to set about ten times as many fires as the fire-fighting services can be expected to control. While this is believed to be an adequate safety factor, only operational experience can determine the actual efficiency of these bombs.

Quick-opening incendiary bomb clusters are discussed in this study because of the availability of test data concerning their ground dispersion characteristics. Aimable clusters would make possible operations at higher altitudes. The use of such clusters would not alter materially the basic conclusions of this study. Essentially, the only modification of the bomb concentration discussed herein which would result from the use of such clusters would be the setting of much more concentrated groups of fires, spaced wider apart.

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INCENDIARY ZONES IN JAPANESE CITIES

Ten of the twenty cities indicated as suitable for incendiary attack have been studied in considerable detail for the purpose of preparing incendiary zone maps. The method employed in determining incendiary zones for Japanese cities differs somewhat from the British method for German cities in that the number of zones is reduced from 6 (British) to 3. British maps of German cities indicate the following zones:

Zone I	Central city areas, fully built up
Zone 2a	Residential areas, fully built up
Zone 2b	Residential areas, 40-70% built up
Zone 3	Suburban areas, 10-40% built up
Zone 4	Industrial areas
Zone 5	Railways, freight yards, ports, and warehouse areas

Aside from the number of zones indicated, one important distinction must be made between these zones and those indicated for Japanese cities; the British percentages of "built up" for German cities are not percentages of roof coverage*, which in German cities is roughly 1/2 to 2/3 the percentage built up. In the discussion of Japanese incendiary zones percentages of roof coverage as such are used.

In this study two incendiary zones and one non-incendiary zone are used. The only essential difference between the two incendiary zones is the concentration of incendiaries required for complete destruction. The three zones have the following characteristics:

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ZONE I - Most Vulnerable Zone

Includes commercial center, inner congested residential area, and some mixed residential/industrial areas, where small factories are closely interspersed with workers' homes. As an average for a number of cities Zone I (a) has a population density of 91,000 persons per square mile, (b) contains 25% of the total city population, (c) covers an area of 0.27 square miles per 100,000 of total city population and (d) has a roof coverage of 50% to 80%. For average weather conditions it is estimated that 6 tons of incendiaries per square mile are required for complete destruction (see Tables V and VI below).

ZONE II - Less Vulnerable Zone

Includes less congested residential areas (but still very congested and vulnerable by European standards), most areas containing port facilities and warehouses, freight yards, etc., most mixed residential/industrial areas, and some strictly industrial areas, in which the factories themselves are vulnerable to incendiaries. As an average for a number of cities Zone II (a) has a population density of 54,000 persons per square mile (b) contains 45% of the total city population (c) covers an area of 0.85 square miles per 100,000 of total city population and (d) has a roof coverage of 30% to 50%. For average weather conditions it is estimated that 10 tons of incendiaries per square mile are required for complete destruction (see Tables V and VI below).

ZONE III - Non-Incendiary Zone

Includes suburban residential areas, park areas (if extensive),

* By roof coverage is meant the percentage of an area (as viewed from the air) which is actually covered by roofs.

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strictly industrial areas in which the factories are of the type not vulnerable to incendiaries, and modern fire-resistive business districts (Tokyo and Yokohama only). Zone III covers large suburban areas having a low population density and a low roof coverage, and includes on the average only 29% of the total city population.

Zone I of Japanese cities corresponds, therefore, to the British designation of Zones 1 and 2a in German cities; Zone II corresponds to Zone 2b, part of Zone 4 and most of Zone 5 in German cities; Zone III corresponds to Zone 3 and part of Zone 4 in German cities. The area of Zones I and II in Japanese cities per 100,000 of total population is about 25% greater than the area of Zones 1 and 2 in German cities (1.12 square miles vs. 0.90 square miles respectively), because Zones I and II in Japan include a large part of what is covered by Zones 4 and 5 in German cities.

Although it is more vulnerable in the sense that it requires a lower density of bombs, Zone I in Japanese cities is not necessarily more important than Zone II. Zone II usually covers more factories and its destruction would have a larger direct effect on war production. Zone I, on the other hand, has a higher population density and, therefore, its destruction would have a greater indirect effect on the Japanese war effort. Per ton of bombs required, the relative importance of the two zones is probably about equal.

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Ten large industrial cities have been subjected to a detailed analysis based on city plans, zoning regulations, fire insurance data, population statistics and numerous photographs. The results of this analysis are summarized in Table V. An analysis of the data in Table V yields the following average indices:

Zone I occupies 0.27 square miles per 100,000 of total city population

Zone II occupies 0.85 square miles per 100,000 of total city population

Zone I has a population density of 91,000 persons per square mile

Zone II has a population density of 54,000 persons per square mile

Zone I contains 25% of the total city population

Zone II contains 46% of the total city population

These indices are useful for estimating the areas and populations of vulnerable zones in other Japanese cities for which detailed information is lacking. They were utilized in determining the incendiary zones in the second group of ten cities included in the selected list. They were especially useful in estimating the vulnerable zones in the restricted naval base cities of Yokosuka, Kure and Sasebo, concerning which very little specific information is available.

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DATA FOR INCENDIARY ATTACK OF JAPANESE CITIES

This section undertakes to apply test data on the AN-M69 incendiary bomb, as summarized in Appendix A, to conditions in Japanese cities in order to determine the concentration of incendiary bombs necessary to insure the setting of general conflagrations. A basic consideration for the discussion which follows is that a going fire started in the congested section of a Japanese city and left unattended will continue to burn and spread until it reaches a major firebreak. This self-propagation of fires constitutes a fundamental difference between German and Japanese cities.

The conflagration susceptibility of Japanese cities is due not only to their predominantly wooden construction, but also to the solid massing of dwellings in "unit fire areas", i.e., a combustible area bounded by firebreaks. As noted in Part V the average spacing of streets in a Japanese city is as follows:

Every 1500 ft.	Streets 100 ft. or more wide
Every 750 ft.	Streets 55-70 ft. wide
Every 250 ft.	Streets 20-35 ft. wide
Lesser distances	Alleys 6-15 ft. wide

Figure 6 in the enclosure entitled "Incendiary Zones in Japanese Cities" illustrates this spacing. The widest streets in this view are approximately 100 ft. Under average weather conditions only streets of 100 or more feet in width will constitute effective firebreaks. The small alleys and 20-35 ft. streets in this view would not be effective firebreaks under any weather conditions, and the 55-70 ft. streets would act as firebreaks only under the most unfavorable conditions of heavy rain and no wind. The wider streets cut the built-up area into blocks ranging from 250 x 250 ft. to about 350 x 350 ft. The central block in this view, which measures approximately 300 x 350 ft. is a good example of a typical unit fire area.

Since streets of less than 100 ft. in width are not effective firebreaks, theoretically one appliance fire* in each 1500 x 1500 ft. area would be capable of destroying the entire area (under average weather conditions), if left unattended. However, in order to saturate the fire defenses and set a concentration of fires sufficient to insure complete destruction, the calculations made in this study are based on starting two appliance fires (in addition to the non-appliance fires) in each unit block area, approximately 250 x 250 ft. This concentration of fires corresponds to 72 appliance fires per 1500 x 1500 ft. unit fire area, or 864 appliance fires per square mile.

Therefore, the basic concentration of fires discussed herein is two appliance fires per unit block area (approximately 250 x 250 ft. or 62,500 sq. ft.) or twelve appliance fires per bomb cluster dispersion area (300 x 1200 ft. or 360,000 sq. ft.). This concentration is considered sufficient to cause all appliance fires within each cluster dispersion area to merge into a local conflagration, approximately 300 x 1200 ft. in size. As indicated in Appendix A, incendiary bombs of the AN-M69 type are capable of starting more than this number of fires per 500 lb. cluster even in the lowest percentage

* An appliance fire is one which is beyond control by hand equipment, such as buckets, stirrup pumps, pump tanks, etc.; it requires attendance by a pumper or other major fire appliance.

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of roof coverage (30%) considered for attack, thus giving these calculations a factor of safety.

In order to start conflagrations of major proportions, however, it is necessary to lay down patterns of clusters so spaced as to accomplish the merging of all cluster-area conflagrations into a general conflagration extending over the entire target area. Any type of attack would be satisfactory which would provide the most economical pattern for attaining adequate cluster density while meeting the defensive requirements of the attacking aircraft.

One method which appears to accomplish these objectives is the employment of elements of six planes dropping parallel rows of clusters, covering an area about 600 ft. wide and several miles long. The diagram which follows illustrates an attack by 24 planes in four such elements. For Zone I and average weather conditions it is estimated that a spacing of 1000 ft. between the parallel rows will result in the fire lanes merging into a general conflagration. For Zone II and average weather conditions, a spacing of 400 ft. is required. The spacings for other classes of weather are summarized in Table VI.

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The incendiary zone analysis in Table V and the bomb density data in Table VI are combined in Table I of the Report section to give the estimated tonnage required within the limits of the vulnerable zones. Data for ten smaller cities, in addition to those analyzed in Table V, have been estimated using the average indices from that table. It will be noted that of the twenty cities, only ten require more than 25 tons of bombs, six require more than 50 tons, and three require more than 100 tons. The Report section includes a map of the Japanese Islands, showing the locations of the twenty cities, their relative importance and tonnages of bombs required.

Operational considerations and statistical qualifications are too complex to permit direct comparison between the tonnages indicated for Japanese cities and British experience with incendiary attacks on German cities. As has been emphasized, the tonnages indicated in this study are in terms of ground concentrations, without taking into account the many operational factors which are involved in corresponding British data. For illustrative purposes only, the recent series of attacks on Hamburg may be cited. In the period July 24 - August 3, 1943, it is reported that approximately 9500 short tons of bombs (4700 tons of I.B. and 4800 tons of H.E.) were actually dropped on the Hamburg area. The area devastated was estimated to be about 8-9 sq. miles. According to Table I, a total of 349 short tons of bombs are indicated for Osaka -- a city roughly twice as large as Hamburg. Properly concentrated, it is estimated that this tonnage will devastate some 39 sq. miles in Osaka. While subject to the important qualifications noted, this nevertheless indicates the greater vulnerability of Japanese cities to incendiary attack.

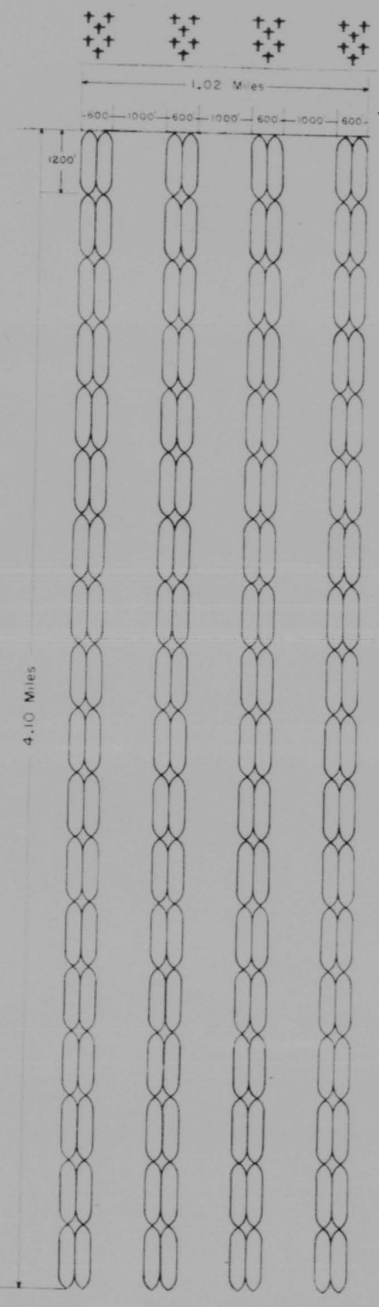
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PATTERN OF INCENDIARY BOMB CLUSTERS
DROPPED BY 24 BOMBERS
FLYING IN 4 ELEMENTS OF 6 PLANES EACH



SPACING BETWEEN LANES FOR AVERAGE WEATHER CONDITIONS
ZONE I — 1000 FT.
ZONE II — 400 FT.

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TABLE V : Incendiary Zone Analysis of Ten Japanese Cities

City	Total Population of City	Area of Vulnerable Zones (sq. mi.)			Area of Vulnerable Zones per 100,000 pop. (sq. mi.)			Population of Vulnerable Zones (in 1000's)			Average Population Density in Vulnerable Zones (per sq. mi.)			Percent of City population in Vulnerable Zones		
		I	II	Total	I	II	Both	I	II	Total	I	II	Both	I	II	Both
Tokyo	6,779,000	10.9	56.6	67.5	0.16	0.84	1.00	1,108	3,248	4,356	103,000	55,000	65,000	16%	48%	64%
Osaka	3,252,000	11.2	28.2	39.4	0.34	0.87	1.21	996	1,538	2,534	81,000	60,000	64,000	31%	47%	78%
Nagoya	1,328,000	5.6	15.2	20.8	0.42	1.15	1.57	364	608	972	65,000	40,000	47,000	27%	46%	73%
Yokohama	968,000	1.0	6.4	7.4	0.10	0.66	0.76									
Kobe	967,000	3.6	6.7	10.3	0.37	0.69	1.06	374	402	776	104,000	60,000	76,000	39%	41%	80%
Hiroshima	344,000	1.8	4.3	6.1	0.53	1.25	1.78									
Fukuoka	323,000	1.3	4.1	5.4	0.40	1.27	1.67									
Yawata [1]	434,000	2.0	2.5	4.5	0.46	0.58	1.04									
Kawasaki	301,000	2.3	2.3	4.6	0.76	0.76	1.52									
Nagasaki	253,000	0.9	0.5	1.4	0.36	0.20	0.56									
TOTALS	14,950,000	40.6	126.8	167.4				2,842	5,796	8,638						
AVERAGES					0.27	0.85	1.12				91,000	54,000	63,000	25%	46%	71%

[1] Includes Tobata, Wakamatsu and Kurosaki

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TABLE VI

Incendiary Bomb Concentrations for Japanese Cities

		Favorable Weather	AVERAGE WEATHER	Unfavorable Weather
Spacing Between Fire Lanes	Zone I	2,500'	1,000'	200'
	Zone II	1,400'	400'	0
500 Lb. Clusters Per Square Mile	Zone I	15	29	57
	Zone II	23	46	75
Tons of Bombs Per Square Mile	Zone I	3	6	12
	Zone II	5	10	16
No. of AN-M69 Bombs Per Square Mile	Zone I	900	1,740	3,420
	Zone II	1,380	2,760	4,500

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Definitions of Weather :

Favorable Weather
(a) Wind 20 miles per hour and no rain.
(b) Wind 30 miles per hour or over and light rain.

Average (Intermediate) Weather
(a) Wind 10-20 miles per hour and heavy rain.
(b) Wind 5-10 miles per hour and light rain.
(c) No wind and no rain.

Unfavorable Weather

(a) No wind and heavy rain.
(b) No wind and deep snow cover.

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FIRE DEFENSES IN JAPANESE CITIES

A basic requirement for the success of incendiary attacks is the saturation of the fire defenses, including

a. the amateur fire guards equipped with pump tanks or stirrup pumps and

b. the professional fire companies equipped with pumpers and other appliances.

No attack, however accurately delivered, can produce conflagrations of any consequence unless the fire-extinguishing capacity of these fire defenses is overwhelmed.

Having observed at close range the effects of incendiary attacks in British and German cities, the Japanese have undoubtedly taken every possible precaution to minimize this danger to their cities. As could be expected in a country which has experienced so many disastrous fires, Japanese fire-fighting services are comparatively efficient and modern. Constantly aware of the threat of fire, the Japanese householder probably received more peacetime training in fire fighting than did the householder of any other nation. With the advent of war, Japan could rely on a well-trained ARP service, each member of which bears the direct responsibility for the protection of his own home.

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The Japanese amateur fire guard is a well-trained service [illegible] "cho" (ward) basis, each cho or group of "chos" being allotted one or more small pumps and other light equipment. In addition, each householder has been drilled frequently by cho leaders and professional firemen. Each home is required to have sand, stored water and specially fitted bamboo poles available at all times. Homes are supposed to be guarded (occupied) at all times and women are drilled along with men, since it is realized that they may bear the brunt of a surprise attack.

This fire guard constitutes the first line of fire defense. It is especially important in fighting fires in the interior of the typical Japanese block where closely-spaced, low frame houses and alley-width streets render the area inaccessible to heavy, professionally-manned appliances. Unless hampered by wind, the civilian fire guard has usually managed to restrict peacetime fires to a few adjacent houses.

The professional fire companies, the second line of fire defense, have a more limited function in Japanese cities than in western cities. Their primary function in congested residential districts is to contain the fire within the limits of natural firebreaks. Only in the limited area of the less congested districts can the larger apparatus operate with efficiency. Few heavy duty ladder trucks and pumpers are required since only a very low percentage of Japanese buildings are over 2 stories in height and none exceeds 8 stories. While the Japanese professional fire appliances have often seemed inadequate to American observers, actually they are well suited to Japanese conditions.

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Because several fires have gone out of control in the past due to the failure of the city water supply, several large Japanese cities are reported to have installed pumps along the rivers and canals in order to be able to utilize this static water. In addition, groups of householders living in the more congested districts have been required to collaborate in building small concrete water storage tanks.

In the largest cities, fire observation towers are manned at all times. Many of the larger public buildings and factories are either equipped with automatic sprinklers or maintain their own light pumpers and fire guard.

The amateur fire guard has been by far the more important in Germany and England, due to the relatively slow development of fires in the heavy construction in those countries, and the large numbers of fire guards, ranging as high as 3,000 per square mile. The British Ministry of Home Security estimates that German fire guards extinguish about 75% of the fires started by RAF raids, counting only those fires which would ultimately have been destructive if unattended. The professional fire companies extinguish a certain additional percentage, and the remainder represents the "profit" or actually destructive fires. The concentration of fire guards in Japan may be assumed to be no smaller than in Germany and England, and it is very likely to be much greater. However, the rapid development of fires in the light Japanese construction neutralizes a large percentage of the fire guard, since many fires will surpass the capacity of their equipment almost before they can get into action.* Tests conducted on sample Japanese dwellings in this country indicate that if the fires set by AN-M69 incendiary bombs are left unattended for about two minutes, the fire guard will be able to extinguish only 23%. 12/ This estimate is essentially independent of the number of fire guards present.

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The professional fire-fighting companies have probably increased tremendously in Japan in recent years as they have in England and in Germany. The London fire department has increased 20-fold in the past four years and similar increases are known to have occurred in other British cities. It has been estimated that the largest Japanese cities will now have about 50 pumpers per square mile in the congested districts.** Tokyo may have a total of 1500 pumpers while Osaka may have 1000 pumpers. It should be noted that the estimate of 1500 total pumpers for Tokyo represents a 30-fold increase since 1929. On the basis of the Osaka total, 30 pumpers per 100,000 of the total city population may be taken as a basis of estimation for other cities. However, the figure of 50 pumpers per square mile in the central sections is the most important factor, since under the conditions of a large-scale incendiary attack there is little opportunity for fire companies to travel far from their own locality.

An attack by 24 planes of the type discussed in the last section would be expected to start a total of 3,000-4,000 appliance fires, based on the assumption that each plane would carry six 500 lb. clusters and that each cluster will start of the order of 20-30 appliance fires (in Zone I). These are the fires remaining after

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* This is in sharp contrast with the slow spread of fire in German construction. British experience indicates that they must maintain a heavy saturation attack for approximately 20-30 minutes in order to keep the fire guard inactive and allow sufficient time to enable the fires to gain decisive headway.

** These estimates were made by Mr. Boris Laiming.

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deducting those which would be extinguished by the fire guards. These appliance fires would be left to the professional fire companies, whose probable effectiveness may be estimated as follows: The area which would be covered by such an attack is approximately 5 square miles (including a strip 500 feet wide on either side of the outer fire lanes), an area in which may be located approximately 250 fire department pumpers. By themselves, therefore, these pumpers could attack less than 10% of the total fires at any one time, even if only 1 pumper per fire were used. In the five largest cities there could be some reinforcement of this number of pumpers, especially if the raid did not exceed the scale of the sample attack discussed above. Under such conditions it is conceivable that as many as 500 pumpers might be detailed to the 5 square mile fire area. In the meantime, however, many fires would be developing to a point requiring several pumpers to keep them under control. This would largely cancel the effectiveness of these reinforcements. Moreover, this analysis probably gives too little weight to the rapid spread of fires in congested urban districts, a factor which sharply reduces the effectiveness of the professional fire companies.

On the basis of the conditions discussed above and tests on typical Japanese structures, it is estimated that (under average weather conditions) entire city blocks in which one or more appliance fires had been set would be involved within 30 minutes after attack. Each such fire would require the attention of 10-15 fire department pumpers. Within 60-90 minutes after attack, it is estimated that adjacent fire lanes would merge into a general conflagration involving the entire bomb cluster pattern area, and beyond control except at isolated points along the periphery.

From the above, it is concluded that, while the highly-organized fire defenses could cope with light and dispersed incendiary attacks, the Japanese fire-fighting services can exert only a negligible effect on the result of a concentrated attack of the indicated type and weight.

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INFLUENCE OF WEATHER CONDITIONS

Varying weather conditions exert a marked influence on the effectiveness of large-scale incendiary attacks. A brief summary of the complex combinations of weather conditions which must be considered is given below. For a detailed discussion of the influence of weather on incendiary attack against Japan, reference is made to "Weather Conditions Affecting Incendiary Bombing of Japan - Report #245" and "Weather Conditions Affecting the Bombing of Japan - Report #463", both issued by H.Q. AAF, Weather Information Service. (These reports are available for distribution with this study under separate cover.)

General Summary

The interior ignition of buildings by incendiary bombs is not affected by weather conditions, although a deep snow cover or extreme precipitation would tend to reduce the possibility of exterior fires resulting from outside ejection hits. Since ignition will occur under nearly all conditions, the weather factor is of importance chiefly for its influence on the rate of spread of fire. The rate of spread is dependent (1) on the wind velocity and (2) on the dryness of secondary surfaces which catch radiated heat, sparks or embers. Of these two factors, the first is by far the more important since the rate of spread of fires is almost directly proportional to wind velocity. With the exception of heavy snow cover or heavy precipitation, the spread of fire is only slightly modified by the degree of dryness of exterior surfaces. (It should be noted in this connection that .19 of an inch of rain fell during the first day of the great Tokyo fire of 1923.)

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Weather Conditions in Japan

The complex weather variations which may be expected over Japan during a year make possible only a few generalizations. One factor which is fairly constant throughout Japan is the diurnal* variation in wind velocity. The greatest wind velocity can be expected between 1200 and 2200 hours with a maximum at about 1500 hours. Another general conclusion, based on the incidence of forest and house fires in Japan, is that the best incendiary conditions throughout the Island of Honshu accompany cold frontal passages (because of the gusty winds which accompany such cold fronts). Incendiary conditions are apt to be more favorable on the eastern coast directly following the cold front and on the western coast directly preceding the cold front (due to lee effect). Humidity variations seem to be of considerably less importance than the gusty winds.

Generally speaking, the most favorable incendiary conditions in the twenty selected cities discussed in this report can be expected during the winter and spring months, December through May, of which March and April are probably the most favorable. These ratings are based on generally favorable weather conditions over the areas in which are located the twenty cities discussed in this study.

The effect of weather on the estimated incendiary bomb concentrations required has been indicated in Table VI, in which three general classes of weather conditions are defined.

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* Daily land-sea breezes common in coastal towns.

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BASIS OF SELECTION OF RECOMMENDED CITIES

The twenty cities analyzed in this study were selected on the basis of (a) their importance to Japanese war production and military potential in relation to their size and (b) their vulnerability to incendiary attack. Since incendiary attacks are generally more effective against large cities, all cities under 100,000 population were excluded, unless they were especially important and vulnerable such as Kurume (90,000) and Nobecka (79,000). Of the 33 cities in Japan between 100,000 and 250,000 population, seven were included in the selected list while 26 were not included, in most cases simply because their small number of military objectives did not justify large-scale incendiary attack. All cities with a population of over 250,000 were included except Kyoto (1,090,000) which is primarily a cultural center and has practically no war industry.

An important contributing factor in the decision to omit Hokkaido's four large cities was the generally unfavorable weather in that area. Another contributing factor in the case of a few cities, notably Shimonoseki and Muroran, was their dissection by hills into such small built-up areas that their vulnerability to incendiary bombing is greatly reduced.

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While the importance and vulnerability of the twenty selected cities is reasonably certain, reconnaissance may reveal that additional cities are sufficiently important and vulnerable to warrant inclusion in further studies. Moreover, the use of aimable clusters of incendiary bombs against important small towns remains to be considered.

Table VII, on the following page, summarizes the known target data for every Japanese city of over 100,000 population which was omitted from the selected list of twenty.

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TABLE VII

Target Summary of All Cities over 100,000 Population Not Recommended for Incendiary Attack

City	Population (1940)	Total Targets	Key Targets	Priority Targets
Kyoto	1,089,726	1	-	-
Sendai	223,630	3	-	-
Sapporo	222,827	3	-	-
Shizuoka	212,198	2	-	-
Kumamoto	210,038	1	-	-
Hakodate	203,862	8	-	-
Shimonoseki	196,022	6	-	-
Wakayama	195,203	0	-	-
Kagoshima	190,257	5	-	-
Kanagawa	186,297	1	-	-
Sakai	182,147	0	-	-
Gifu	172,340	0	-	-
Hamamatsu	166,346	5	1	-
Otaru	164,282	2	-	-
Okayama	163,552	2	-	-
Toyohashi	142,716	2	-	-
Toyama	127,859	1	-	-
Tokushima	119,581	2	-	-
Matsuyama	117,534	0	-	-
[illegible]	111,796	3	1	1
Takamatsu	111,207	1	-	-
Muroran	107,628	7	1	1
Kochi	106,644	7	-	-
Himeji	104,259	5	-	-
Yokkaichi	102,771	0	-	-
Kofu	102,419	1	-	-
Ube	100,680	5	1	-
TOTALS		72	4	2
Percent of Total in Japan Proper		7%	3%	5%

Source: Targets compiled from "Japanese Target Data - March 1943"

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EFFECT OF PEACETIME CONFLAGRATIONS IN JAPANESE CITIES

Many fires of conflagration proportions, involving groups of various types of buildings and getting out of control for over one hour, are reported in Japanese cities virtually every year. Following is an incomplete list of major conflagrations, involving 1000 or more structures, which have occurred during the past 40 years:

	City	Year	Month	
1.	Hakodate	1907	August	
2.	Osaka	1909	July	
3.	Tokyo	1911	April	
4.	Osaka	1912	January	
5.	Tokyo	1913	February	
6.	Hakodate	1916	August	
7.	Yokohama	1919	April	Note that 14 of
8.	Tokyo	1921	April	the 21 listed con-
9.	Hakodate	1921	April	flagrations occurred
10.	Tokyo-Yokohama	1923	September	during the months of
11.	Niigata	1925	October	Dec. through May.
12.	Tokyo	1925	March	These are the months
13.	Kyoto	1925	May	indicated to be
14.	Takano	1927	March	favorable for in-
15.	Naka	1927	March	cendiary attack.
16.	Yamanaka	1931	May	
17.	Tokyo	1932	December	
18.	Komatsu	1932	October	
19.	Hakodate	1934	March	
20.	Takaoka	1938	September	
21.	Shizuoka	1940	January	

The most complete records available in the United States are those dealing with the Tokyo-Yokohama earthquake and fire of 1923. The damage by fire alone in the city of Tokyo proper resulting from this disaster may be summarized as follows: 38/

17 square miles	devastated by fire
$1,450,000,000	total loss, including:
$700,000,000	merchandise and stored goods
$450,000,000	buildings
$250,000,000	household goods
$80,000,000	equipment and machinery
$140,000,000	government loss*
218,994	buildings burned, including:
10,284	warehouses**
8,080	factories***
4,470	office buildings and banks
3,477	government and official buildings
2,365	temples, shrines and churches
1,386	schools and libraries
292	bridges burned (11 steel bridges)
60%	of city railway system destroyed, including power stations, car barns, and
900	street cars
3	large and several small R.R. stations
1,000	railway cars
all	overhead wiring in the burned area
1,384,000	persons dehoused (61% of population)
76,536	persons killed, fatally injured or missing
18,392	persons injured, not fatally

* Includes Army & Navy establishments, government railways, Post and Telegraph Departments, etc.

** Includes 9 largest warehouses in Tokyo in which goods valued at $35,000,000 were destroyed.

*** Includes engineering works, munitions plants, dockyards, gas and electric plant, textile mills, printing shops, cement mills, woodworking plants, etc.

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The photographs on the following page indicate the scale of destruction in these fires. Numerous additional photographs are to be found in References 24, 26 and 36. The photographs show that practically all wooden buildings in the path of the conflagrations were completely consumed and that a large proportion of fire-resistive buildings were either gutted or seriously damaged. The general scope of the damage resulting from these fires was paralleled in a proportionate degree by the damage in the more recent fires in Hakodate (1934) and Shizuoka (1940).

Since the Tokyo disaster of 1923 was a combined earthquake and fire, it is important to note that all authorities are agreed that fire caused by far the greater part of the damage. This is illustrated by the following data for Tokyo city:

Structures wholly destroyed by fire	218,901	97.5%
Structures partially destroyed by fire	93	0.0%
Structures wholly demolished by earthquake	2.705	1.2%
Structures partially demolished by earthquake	2,868	1.3%
Total	224,567	100 %

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Two important conclusions may be drawn from these data:

(a) 97.5% of all buildings destroyed were destroyed by fire.

(b) Fire damage was virtually 100% complete whereas half the earthquake damage was partial.

It is significant to note that, according to the data in Table I, a fire on the scale of the Tokyo fire of 1923 can reasonably be expected to result from the suitable concentration of about 158 tons of incendiary bombs. The magnitude of the devastation which may be expected in cities subjected to large-scale incendiary attack is indicated by the fact that the tonnage of bombs suggested in Table VI would be expected to devastate about 67.5 square miles in Tokyo city as compared with 17 square miles destroyed in the earthquake and fire of 1923. A total of 186 square miles would probably be devastated in all the twenty cities selected for attack. This would correspond to four "Tokyo fires" in the city of Tokyo or to eleven "Tokyo fires" in the twenty selected cities.

The favorable conditions of average weather (.19 of an inch of rain fell during the first day, but a fresh breeze prevailed) and disrupted water supplies which were present in the Tokyo fire would be compensated for by the far greater magnitude of a large-scale incendiary attack. For instance, the Tokyo fire of 1923 is reported to have started from a total of about 80 initial fires, whereas an incendiary attack employing about 158 tons of incendiary bombs would be expected to start between 15,000 and 20,000 appliance fires in a similar area. As discussed in Part VI the magnitude of such fires would virtually neutralize the fire defenses and could be expected to develop into sweeping conflagrations under any but the most unfavorable weather conditions.

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EFFECT ON JAPANESE WAR EFFORT

The total effects of incendiary attack upon Japan are a composite of many tangible and intangible factors, which may be summarized as follows:

I. Direct Effects: Destruction of industrial plants and other military objectives.

A. Production Facilities: Large munitions factories and civilian industries; small factories.

B. Military Establishments: Arsenals; barracks; embarkation facilities.

C. Storage Facilities: Warehouses and temporary storage sheds; military supply depots.

II. Indirect Effects: General disruption of local economy and reduction of workers' efficiency.

A. Reduction of Workers' Efficiency: Destruction of homes and forced migration to outlying shelter areas; destruction of household belongings and essential consumer goods in local stores; lowered health conditions due to damaged public utilities.

B. Casualties among Workers: Direct raid casualties.

C. Damage to Transportation Facilities: Railroad stations and rolling stock; local electric car and bus terminals and rolling stock; wharves.

D. Damage to Public Utilities: Principally overhead wiring; some electric substations.

E. Absorption of manpower and materials in reconstruction.

F. Morale: Reduction of will and capacity to continue war effort.

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Direct Effects

Generally speaking, the prospects of obtaining direct effects against Japan's war potential by incendiary attack are considerably greater than they are in Germany. (1) Japanese cities are much more combustible and consequently more susceptible to sweeping fires or conflagrations. (2) Japanese war industry and industrial population are more highly concentrated in a few large cities than is true in Germany. (3) Factories and warehouses in Japanese cities are more often adjacent to or surrounded by combustible residential districts.

Studies made by the British Air Ministry following the "Battle of Britain" conclude that the damage done to industrial plants (especially machinery and other "engineering plants") by incendiary bombs was five times as great as that done by H.E., on a ton for ton basis. 23/ These and subsequent studies made by British and United States industrial fire experts have indicated that many industrial

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plants are vulnerable to incendiary bombs, and that damage done by fire to such plants is more complete and lasting than that done by the blast force alone of H.E.

This experience has been applied in this study as a basis for estimating the damage which may be done to Japanese industrial plants by incendiary attacks. Each industrial plant located in the twenty selected cities which is listed as an air attack target in Air Objective Folders has been studied to determine:

(a) the fire hazard inherent in the plant's construction,
(b) the fire hazard due to the presence or absence of combustible contents in the plant and
(c) the plant's exposure, i.e. its location with respect to nearby combustible structures.

Since the available information does not cover adequately all of these factors, this analysis has also been based on the principles of probability.

For this reason the following classes of damage are described:

A - Targets probably destroyed or seriously damaged by a general conflagration.
B - Targets probably not seriously damaged, but production reduced by indirect effects.
C Targets neither seriously damaged nor affected by indirect effects.

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Class "C" covers installations which are not dependent on large numbers of workers, such as isolated storage and railway targets, [illegible], water supply installations and outlying military installations. A target is listed in Class "A" if the probability of its being destroyed in a general conflagration is considered to be greater than 50%; it is in Class "B" or "C" if the probability is less than 50%. Some targets in Class "A" have a very high probability of being destroyed (say 90% or greater), while the probability of others in this class ranges down to 50-60%. On the other hand, some of the targets in Class "B" may be destroyed or seriously damaged. These uncertainties should cancel out in the overall statistics.

The targets discussed in this study are compiled from the Air Objective Folders in the Japanese series issued by AC/AS, Intelligence. These folders list a total of 1059 numbered targets for Japan Proper, excluding Karafuto and other parts of the Japanese Empire and controlled territories. These numbered targets, (as distinguished from the myriad of unnumbered, minor installations, such as small factories, warehouses, etc.) are referred to as "Selected Targets" in this study. These targets are evaluated and rated in the special study entitled "Japanese Target Data, March 1943" as follows:

1. Key Targets: Selected from the total numbered targets, these are the more important objectives for strategic air attack against Japan. Each one is so rated because it constitutes a significant percentage of the capacity within its target category and contributes substantially to the war effort. There are 153 Key Targets in Japan Proper.

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2. Priority Targets: Among the Key Targets, 39 Priority Targets in Japan Proper are considered to be objectives for air attack, the destruction of which would have the greatest per-target effect on Japan's war potential.

The effects of incendiary attack on these targets is summarized in Tables II and III in the Report section of this study. These tables indicate that successful incendiary attacks against Zones I and II of twenty Japanese cities may destroy or damage seriously 136 Selected Targets, of which 83 are industrial production units -- representing 15% of all production units in Japan Proper. Of these, 9 are Key Targets in terms of the total Japanese Empire war economy. In addition, it is estimated that some 267 industrial production units, representing an additional 48% of all such targets in Japan Proper, would suffer a reduction of output as a result of the indirect effects of incendiary attacks. Of these, 79 are Key Targets, constituting 52% of all Key Targets in Japan Proper.

Thus, incendiary attacks directed at twenty Japanese cities may destroy or otherwise reduce the output of 403 industrial targets, constituting 63% of all the numbered industrial targets in Japan Proper. More important, this includes 88 Key Targets, or 58% of all the Key Targets in Japan Proper. Because of their location and vulnerability to fire, many of these factories could be neutralized with much greater economy of effort by incendiary bombing than by individual H.E. attack, allowing for probable error, difficulty of target identification in congested areas, etc.

0030

[illegible] and household industries located in the twenty cities. While most of these plants are of minor importance individually, their aggregate production is of much significance. In spite of complete war conversion, Japan probably still utilizes far more of these small production units than does any other belligerent. Even in peacetime, these small plants were thoroughly organized and closely linked to large factories by an extensive system of sub-assembly and sub-contracting. Recent information (late 1941) indicates that this system continues. In Nagoya city, for example, three large bicycle assembly plants obtained virtually all their components from many satellite household shops in the neighborhood. These are all working on army contracts now. Many of the larger toy shops (almost all of them household industries) are now engaged in finishing and assembling small components. Household cutlery shops are reported to be producing components for precision instruments. Because of their large number, their small size, and their dispersion throughout the large cities, these plants constitute poor individual targets; they can best be neutralized by widespread conflagrations.

A study of the distribution of all known factories in the cities of Tokyo, Osaka and Nagoya which employed five or more persons (1938-39) may be summarized as follows:

City	Total 33/ Factories	Estimated Number In Zones I & II	Estimated % in Zones I & II
Osaka	15,677	13,000	83%
Tokyo	15,419	10,800	70%
Nagoya	5,863	4,200	72%
Totals	36,959	28,000	--

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The number of these plants located in Zones I and II is extrapolated from the known locations of 813 factories in Tokyo, 681 factories in Osaka and 200 factories in Nagoya.34/ The vast bulk of these plants are small establishments employing five to 100 workers. This list also includes the listed factory targets which are covered in "Japanese Target Data - March 1943", but numerically these comprise only a small fraction of the total. Generally speaking, the totals given above are indicative of the extremely dispersed production of small components which is characteristic of Japanese industry. Since most of these small plants are of the household variety, their construction is highly combustible and they are surrounded by densely-clustered workers' homes. It seems reasonable to assume that the great majority of plants which are located in Zones I and II are likely to be destroyed by conflagrations in these zones.

In addition to the effects on industrial targets as such, large-scale incendiary attacks against the twenty cities would probably destroy or damage seriously about 38 major storage objectives of various kinds, including both military and civilian warehouses and storages. This represents approximately 29% of all such objectives in Japan Proper. Also probably destroyed or damaged seriously would be some 9 transportation objectives (9% of all such targets in Japan) and 5 miscellaneous targets.

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Indirect Effects

[redacted] incendiary attacks appear difficult to appraise, because of the so-called "indirect effects" which are added to the direct effects. These indirect effects are more diffused and their [redacted] while likely to be more temporary, the aggregate result of lowered worker efficiency, disrupted local transport, disorganized public services, etc., is a reduction in war production comparable to the destruction of plant capacity as such.

The possibilities of obtaining indirect effects from large-scale incendiary attacks against Japanese cities are also greater than they are in Germany. While the conclusions of this report do not depend as heavily on indirect effects as do British estimates of attack results against German cities, these effects should not be minimized. The disruption of the social-economic lives of large industrial cities has already proved successful in reducing significantly Germany's war potential, according to British estimates. Greater results may be expected in Japan. A larger proportion of the total national industrial population is concentrated in a few large cities and these cities are far more combustible than are German cities.

A higher expectation of indirect results obtainable in Japan must be qualified in at least one respect. While a much greater result can be expected per ton of bombs used, less effect is obtained for a given number of persons dehoused. This is due to Japan's lower standard of living and to the relative ease with which the typical Japanese house can be replaced. Based on observations during the earthquake and fire of 1923 and during subsequent disasters, Japan can be expected to supply cheap, temporary houses for thousands of homeless persons in a relatively short time, although only the barest minimum of shelter and supplies would be restored.

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On the other hand, Japan's civilian economy has been on a minimum basis for several years. The remaining inventory of civilian goods is reported to be extremely low and its replacement would impose a severe burden upon the industrial economy. Experience in Britain and Germany tends to show that there is a reasonably definite "elastic limit"* to the capacity of any city to withstand mass bombing. If a city is still expanding its war potential, if both transportation and food are abundant and housing facilities are ample to house not only war workers but also a large "non-essential" civilian population, a city may be said to be below its elastic limit. 5/ It can absorb a considerable amount of air raid punishment and still maintain adequate war production, as did most of the British cities during the attacks of 1941. Numerous reports emanating from Germany recently indicate the mounting pressure of large-scale air attacks. On August 4, 1943, many weeks after the latest attack on Essen, the "National-Zeitung" expressed alarm over the fact that the administration of Essen's public services had broken down completely, and public health was gravely menaced. So widespread is the pressure of the so-called indirect effects in Germany that even cities which have not as yet experienced any large raids are being affected. Early in August it was reported that ration books for textile products were being annulled throughout Germany, and the sale of household linen and clothing was being restricted to air raid victims. Recent estimates (Sept. 1943) indicated that approximately 6,000,000 persons have been dehoused and forced to migrate to temporary shelter areas. The destruction of civilian goods, and factories which produce such goods, imposes a severe burden on the war economy by diverting critical manpower and materials from direct war production.

Urban conditions in Japan today are strained as a result of war conversion. The labor supply is intensively mobilized and transport facilities are taxed to the limit. Reserves of food and other essential supplies are believed low and industry is fully converted. These factors serve to lower the elastic limit of the large cities and tend to cancel out Japan's advantage based on her lower living standard. This, added to the greater vulnerability of her cities, renders reasonable the expectation of high indirect results.

Morale

While the evaluation of incendiary attacks in terms of their effect on mass morale is not within the scope of this study, certain aspects of this problem are sufficiently pertinent to warrant brief mention. Experience both in Britain and in Europe has produced no conclusive demonstration of the value of incendiary attacks as a method of psychological warfare but does indicate that attacks must be sustained and concentrated in order to be effective. Light, intermittent attacks tend to evoke a mass resentment which largely counteracts any lowering of morale. While very few people abandoned their homes and their work during the blitz against England or in the earlier stages of the attacks on Germany, greatly intensified attacks against German cities have forced mass migrations and produced near-panic conditions in many cities.

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* A city's ability to maintain full or almost full war production and essential social services following concentrated attacks.

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SUMMARY OF TOTAL EFFECTS ON WAR PRODUCTION

While morale and related factors are important, this study is primarily an evaluation of the effect of incendiary bombing upon Japan's industrial war potential.

The ramifications and cumulative effects of large-scale incendiary attacks preclude a static estimate of the reduction of war production which is accomplished. Indirect effects, such as widespread dehousing and disruption of public services, cannot be measured accurately. In the case of direct destruction of plant capacity, the time factor (time required to replace or restore destroyed capacity) is especially difficult to calculate since the enemy's recuperative power (1) varies with the general level of the war economy and (2) on a short term basis, is inversely proportionate to the scale and intensity of the attacks.

While it is not possible to present an accurate quantitative estimate of the loss of war production resulting from the attacks indicated herein, the general magnitude of this loss can be indicated. On the basis of the calculations in this study and an appraisal of the targets involved, it is estimated that successful attacks on the twenty cities would result in a loss of war production of the following order:*

Attack Damage	Production Loss	Duration of Loss
1. Destruction of 85 large factories (9 Key Targets)	8%	6-12 months
2. Destruction of [illegible] factories	10%	3-6 months
3. Indirect effects on 267 large factories (79 Key Targets)	10%	1/2-1 month
4. Destruction of stored raw materials, finished goods and components	1%	1-2 months
5. Damage to transportation facilities and other services essential to war production	1%	1-2 months
Estimated Total Loss	30%	4-6 months

These estimates cannot be substantiated statistically on the basis of available information, and they are subject to various qualifications, but they are believed to be conservative. Item #1, for example, is based on the probable destruction of 15% of all the numbered factory targets in Japan Proper; these include 9 Key Targets, producing aircraft, ordnance, machine tools and electrical equipment. However, many of the plants in item #1 are not major production units. Therefore, a total production loss of only 8% is estimated. Item #2 is based on the probable destruction of about 25,000 small plants (approximately 20,000 in Tokyo, Osaka and Nagoya and 5000 in the remaining cities). These small plants produce a significant percentage of the many components and sub-assemblies

* This estimate is necessarily based on the assumption of concurrent effects in the twenty cities.

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required by the large factories. If these small plants averaged only twenty workers each, their aggregate employment would be 500,000 -- equivalent to 100 large factories, each employing 5000 workers. Item #3 is based on the reduction of output by indirect effects of 48% of the numbered factory targets in Japan Proper, 79 of which are Key Targets, i.e., key production units. On the basis of available reports concerning British experience following comparatively light attacks, the estimate of 10% loss seems reasonable -- particularly in view of the short recuperation period indicated.

The estimates concerning duration of loss are based on the probable time required to replace or repair the installations affected. As indicated above, this time factor may vary, but the time periods noted are believed to be conservative.

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TOKYO

Population - 6,778,804 (1940).

Location - NW head of Tokyo Bay, Latitude 35° 40' N., Longitude 139° 45' E.

Importance - Tokyo's industrial importance has often been exaggerated by estimates which included the industrial output of its satellite cities (see Kawasaki and Yokohama). Even when this adjustment is made, however, Tokyo ranks as Japan's leading manufacturing city, although it is not the major center of heavy industry (See Osaka, Kobe and Yawata). Its most important industries are:

(1) Machines and machine tools (heavy machinery, all types of machine tools and electrical equipment),

(2) Aircraft (engines and instruments),

(3) Arms-Munitions (ordnance, aircraft cannon, tanks and gun powder) and

(4) Communications Equipment (radio and radio detection equipment, telephone and telegraph equipment).

Among the other important industries are iron and steel, automobiles and motors, chemicals, oil refineries and shipbuilding. In addition, there are thousands of miscellaneous small plants whose total output (machines, tools, components of all kinds and food processing) is of considerable significance. An indication of the number of such small plants scattered throughout the city is given by 1938 statistics stating that there were 15,419 industrial plants in the city (employing 5 or more persons).

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center of the Empire, the political and economic nerve center of Japan's war effort. The great combines which dominate Japanese industry have their headquarters here. These factors combine to give Tokyo a great psychological hold on the Japanese masses. Effective dislocation of these control points would have wide ramifications throughout the Empire.

This is also Japan's most vital railway center, the focal point of all the Honshu main lines. Although several alternate connecting lines are available, disruption of rail traffic here would be felt throughout Japan. Even more important would be the effect on the city's own industries, since Tokyo is located far from sources of essential raw materials. With the heavy pressure being exerted on her shipping, Japan has become increasingly dependent on rail transportation.

General Description - Tokyo constitutes the northernmost extension of a mass of urban development which starts in Yokohama and continues northward virtually unbroken for about 25 miles along the shore of Tokyo Bay. The city lies at the edge of a large plain; there are no appreciable hills within 10-15 miles on all sides. Most of the city lies at sea level, with a few points rising to about 120 feet.

The city is not laid out in the typical Japanese pattern. It is a large, sprawling metropolis (approximately 360 square miles in all), with a densely congested core (some 30 square miles) and large, scattered settlements branching off NW, west and SW. More than any other large Japanese city, it is extensively cut up by parks and wide avenues, as well as rivers and canals. Most conspicuous among the open spaces in the city

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Tokyo (Cont'd.)

are the centrally located Imperial Palace Grounds. To the east the winding Sumida River flows through the most densely built-up part of the city. The Ara Waterway, a smoothly curving river, flows along the eastern and northern limits of the congested areas.

There is a fairly distinct zoning pattern. The administrative and commercial district lies between the Palace Grounds and the Sumida River, extending northward to Ueno Park, the largest park in northern Tokyo. Just east of the Palace Grounds are the Tokyo RR Station and the famous Marunouchi district where the offices of Japan's leading commercial and industrial concerns are located. Army and Navy headquarters, the Imperial Diet and other public buildings are located just south of the Palace Grounds. The public buildings immediately east and south of the Palace Grounds, modern western-type structures, are almost entirely fireproof and the area is cut-up by very wide, landscaped streets. Just east of the Palace moat which separates this area from the rest of Tokyo is the city's leading mercantile district. The southern part, known as the Ginza district is the site of Tokyo's largest stores and shops. Extending northward to Ueno Park in a solid mass are large stores, shops and business offices, and congested dwellings.

The largest industrial area lies between the Sumida and Ara Rivers on the eastern side of the city, and bends westward along the southern bank of the Ara River in northern Tokyo. This industrial zone has three types of factory concentrations: to the south are lumber mills and storages and food processing plants; in the center, along the Sobu Railway Line, is a miscellaneous concentration of medium sized steel mills, oil refineries, machinery, chemical and textile plants; the great Koishikawa Arsenal area covers the northwestern part of this zone. In addition to these plants, hundreds of smaller factories of all kinds extend throughout the entire area. [illegible] in the southernmost part of the city, the site of aircraft, steel, machinery and communications equipment plants.

The most congested residential area lies to the east of Ueno Park. Dense clusters of workers' homes extend NE and SE from this area into the industrial zone. Other predominantly residential areas are located north, west and south of the Palace Grounds, in scattered settlements separated by parks, school grounds, etc. To the SW of the Palace Grounds is an open area of official residences, foreign embassies and schools - designated as a non-incendiary area on the accompanying zone map.

Tokyo's vulnerability to fire is too well known to warrant emphasis here. However, this vulnerability must be qualified in several respects. For example, the distribution of population is uneven and congestion varies considerably, an important factor in planning incendiary attacks. According to the calculations made in this study, Tokyo's population density ranks second only to that of Kobe, among the large cities. Zone I has a density of 103,000 persons per square mile, while Zone II has a density of 55,000. The average density of Zones I and II combined is about 65,000 persons per square mile. Twenty-two percent of the total population lives east of Ueno Park, in an area of 15 square miles - less than 5% of the total city area.

The city's vulnerability is further increased by the combustible nature of its construction. Lowest estimates place the amount of predominantly wooden structures at over 90% of the total. As projected in the reconstruction program following the earthquake and fire of 1923, approximately 22 square miles were to be rebuilt as "fire-prevention

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Tokyo (Cont'd.)

zones", an area equal to 7.3% of the total area of the city in 1923. This goal was never fully attained, the Marunouchi business center being the only nominally fireproof district in present-day Tokyo. Of the 1,029,695 buildings listed in the city in 1937,

609,309 were single-story, wood and adobe structures
412,174 were two-story structures, mainly of wood and adobe
9,312 were three or more stories, of varying construction

While the reconstruction program was not fulfilled as regards the construction of fireproof buildings, it was more fully realized in the establishment of "conflagration stops" throughout the city. As noted above, present-day Tokyo is more cut-up by parks and wide avenues than any other large Japanese city. Scattered throughout the city are three large and about 51 small parks. There are several cross-town avenues over 100 feet wide and many streets over 75 feet wide. The districts cut out by these wide streets, however, are broken only by alley-width streets. This is borne out by 1935 statistics, largely applicable today. Of the total of 7,800,000 kms. of streets in the city at that time, only 1.5% were between 88 and 235 feet wide - constituting effective firebreaks under most conditions. About 13.5% were between 23 and 69 feet wide and the remainder, or 85%, were between 8.8 and 18 feet wide. These streets would not constitute firebreaks, even in the absence of wind.

Fire Areas - Two general fire areas are indicated. As a result of the uneven distribution of congested areas noted above, a proportionately greater [illegible] necessary for other cities.

[illegible] located along both sides of the middle Sumida River. Within this zone population density ranges from 60,000 to over 135,000 persons per square mile, while roof coverage (amount of total area covered by buildings) averages over 65%.

This zone covers residential, commercial and industrial concentrations. The commercial district is located to the west of the Sumida River, an area of large stores and shops with warehouses and residences along the river. The residential portion of this zone, the most dense in Tokyo, extends east from Ueno Park along both sides of the river. Highly inflammable homes crowd one another in small blocks, cut out by medium width streets. The southeastern corner of the zone covers an industrial and warehouse area, to the south of the Sobu Railroad line. An oil refinery, food processing plants, lumber storages and miscellaneous small factories cover this area. The banks of the canals and of the Sumida River are lined with flimsy warehouses and cheap homes.

Zone II - Zone II extends in an almost complete circle about the Palace Grounds and Zone I, and projects southward along the bay. It is a mixed area, primarily industrial along the eastern half and residential along the western half. Congestion varies considerably, reaching a peak to the south of the Palace Grounds, where population density averages over 80,000 per square mile.

The part of Zone II which projects southward from the Palace Grounds is a mixed residential/industrial area. The vital Tokaido Railway line which parallels the coast separates roughly the residential region to the

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Tokyo (Cont'd.)

west from the industrial coastal belt. This industrial belt contains most of Tokyo's larger industries, including aircraft plants, ordnance, machinery and machine tools, communications equipment (including radio detectors), a shipyard and an alloyed steel plant. Also located here are several railroad freight yards and cargo piers. A gas plant (marked by two large holders) is conspicuous on the waterfront. To the west of this industrial belt, dense clusters of residences extend among parks and school grounds.

The eastern part of Zone II, the semi-circle which extends south, east and north of Zone I, is predominantly industrial. Several hundred significant factories dot this area, of which the most important are oil refineries, steel plants, chemicals, machinery and machine tools, textile mills, lumber yards and food processing plants. Parts of this area, especially in the NE, are densely populated, homes and small factories crowding one another in a solid mass. According to industrial insurance ratings the fire hazard throughout this area is high. Hundreds of warehouses line the canal banks and the railroad freight yards.

The northwestern part of Zone II is primarily residential. To the north lies the extensive Koishikawa Arsenal area, an open military region with munition plants interspersed among low hills. A few small munition plants and several Army engineering schools are located just south of the arsenal area. The conspicuous Oji Freight Yard, an important marshalling yards, lies in the northern part of the zone. The bulk of this part of the zone, however, is covered with fairly well-spaced dwellings.

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SECRET

TOKYO



Looking north across the heart of Tokyo. View includes all of Zone I, most congested area in city. Note how wide streets cut up area into numerous "Fire units". The open Marunouchi commercial district is seen at left.

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TOKYO



Detail of residential congestion in Zone I. View shows "Fire units" formed by wide streets.



Better-spaced middle class residences in western part of city. View shows interspersion of small factories, parks, schools and better residences which characterize western parts of Zone II.

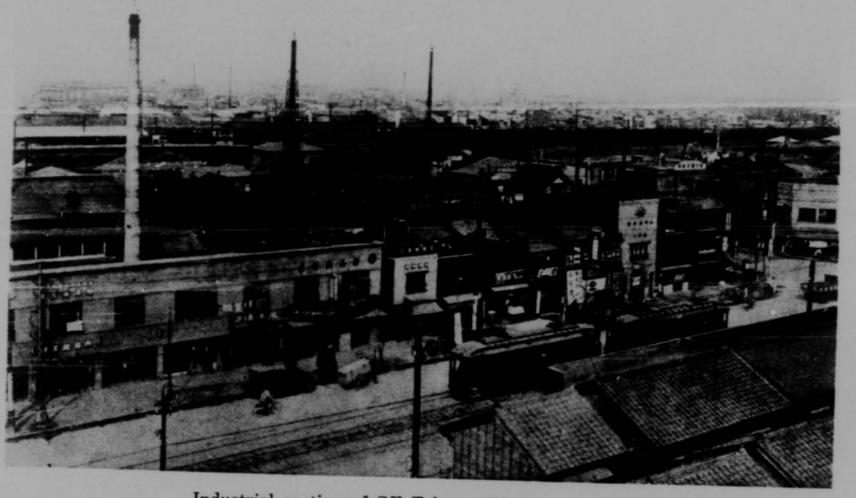
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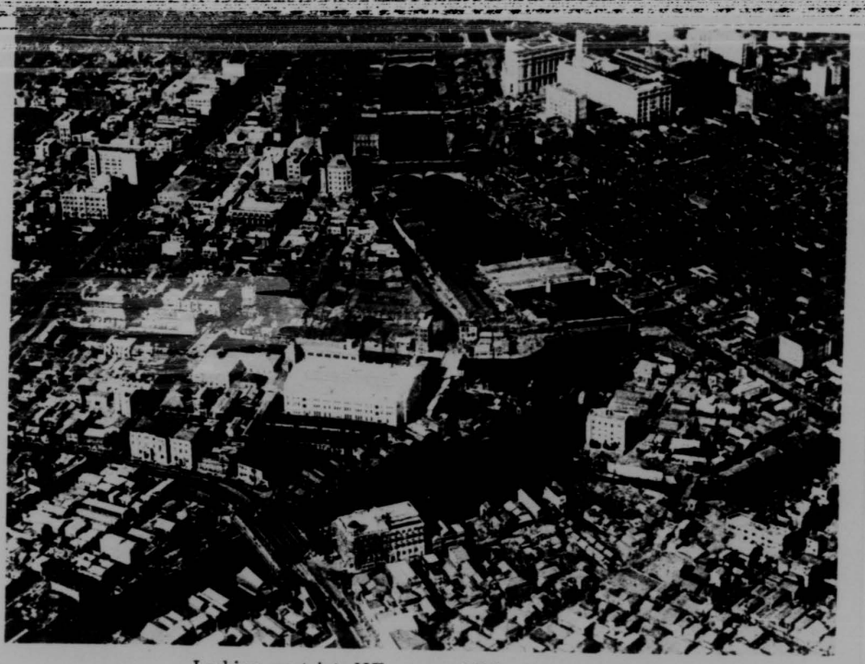
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TOKYO



Industrial section of SE Tokyo. View shows small factories completely surrounded by workers' homes. In the distance are large factories. View covers SE corner of Zone I and part of Zone II fire areas.



Looking west into NE corner of Tokyo's commercial section. View shows sharp line of demarkation between business buildings in non-incendiary part of city and inflammable residences in Zone I.

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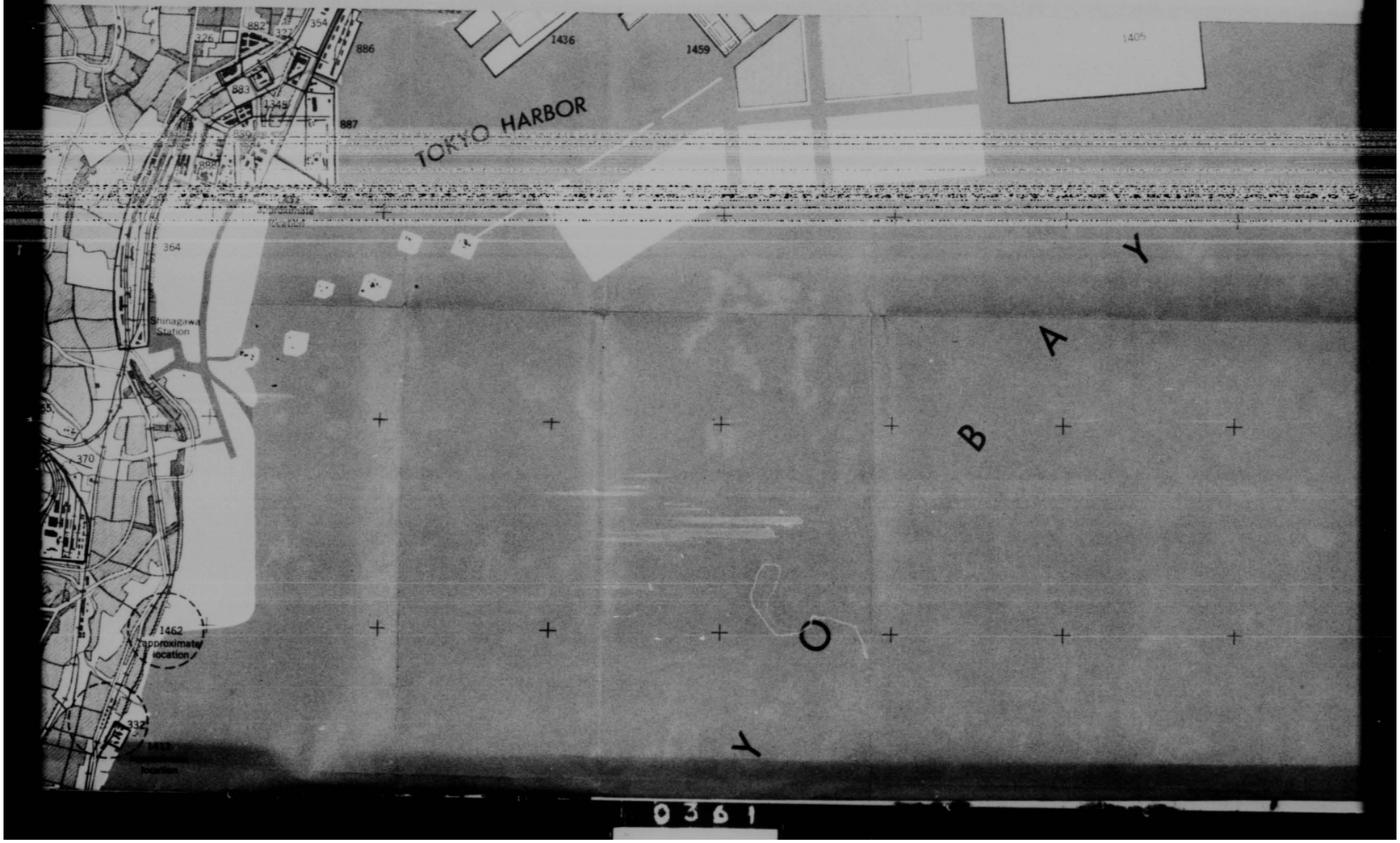
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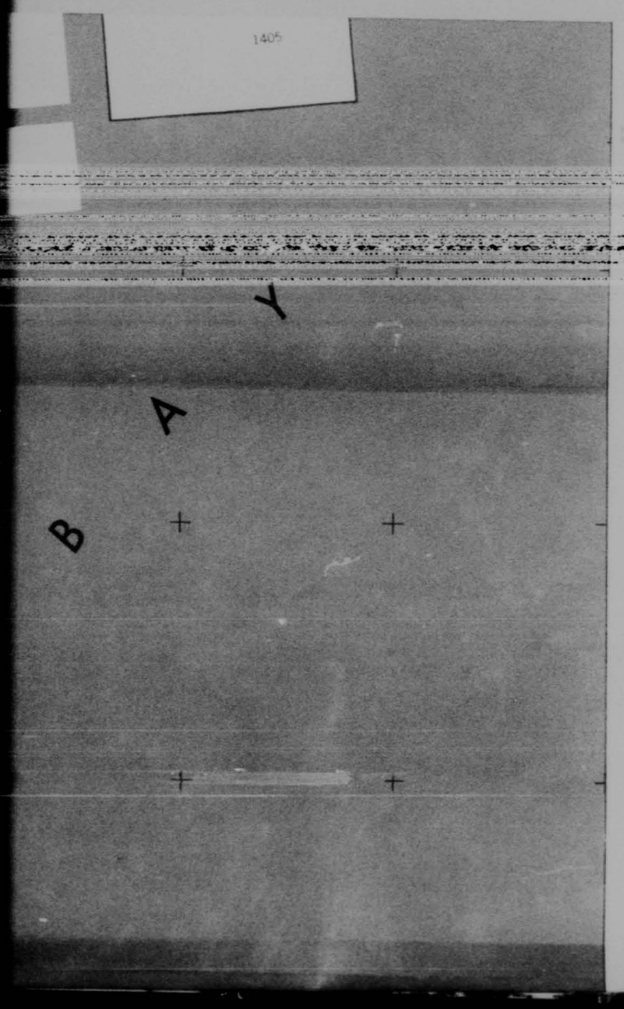


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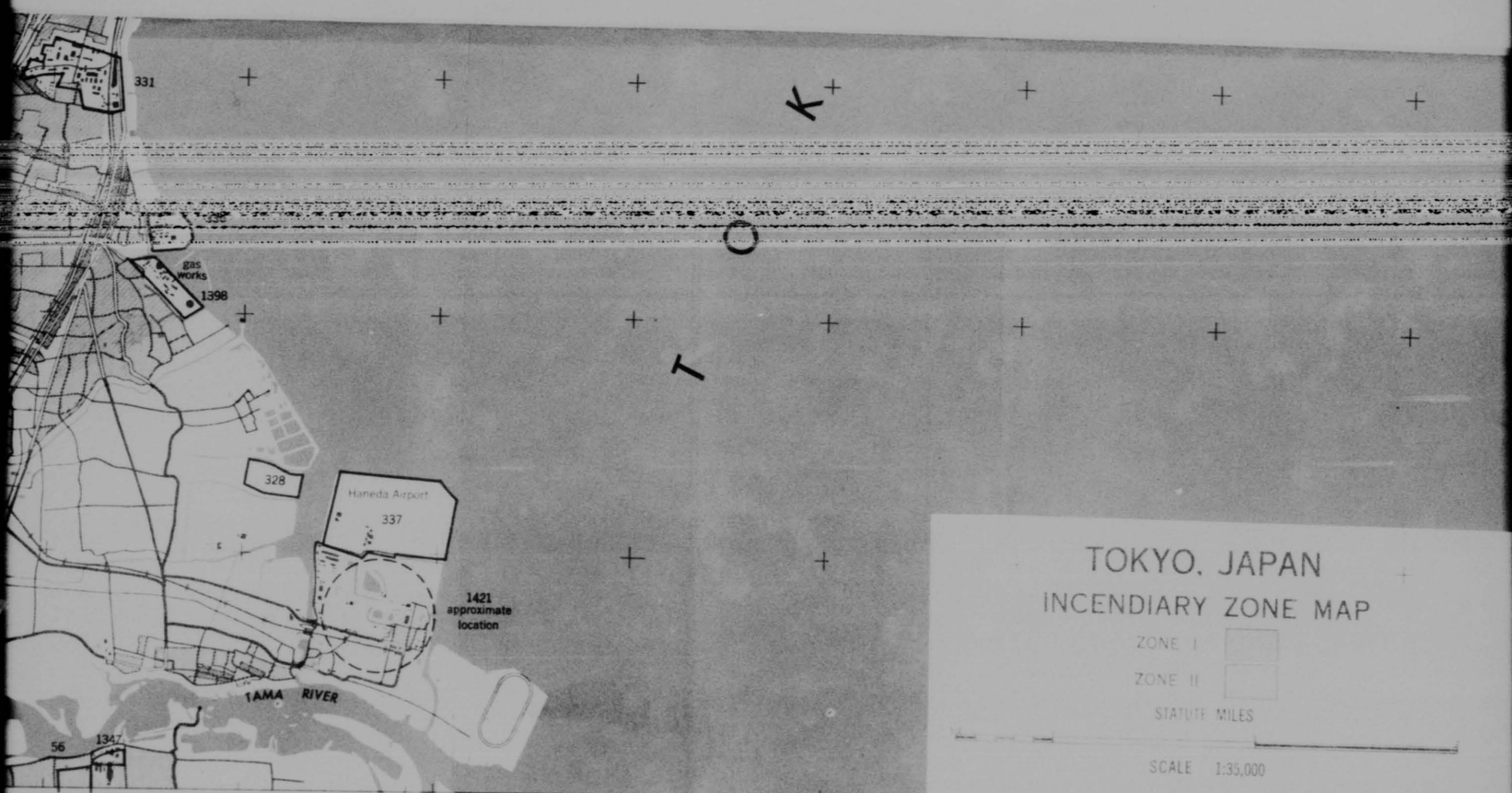


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TOKYO, JAPAN

INCENDIARY ZONE MAP

ZONE I

ZONE II

STATUTE MILES

SCALE 1:35,000

OFFICE OF THE
ASSISTANT CHIEF OF AIR STAFF, INTELLIGENCE
WASHINGTON, D. C.

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FOR TARGET DETAILS SEE AIR OBJECTIVE FOLDER
TOKYO AREA, NO. 90-17, ISSUED SEPT. 15, 1943

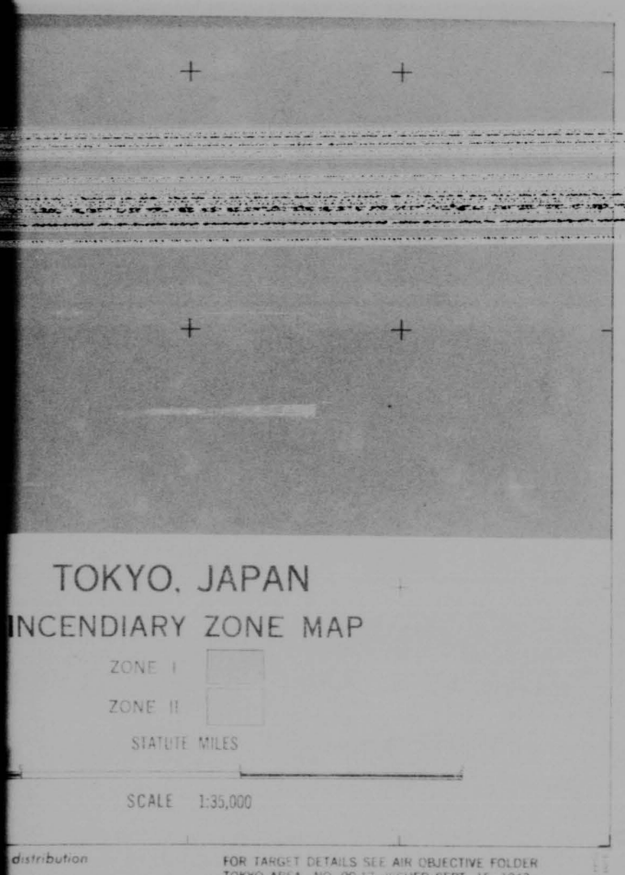
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SELECTED TARGETS IN TOKYO CITY

Source: Air Obj. Folder, No. 90.17, Tokyo Area

Target No.	Target Name	Significance	Zone - Vulnerability
	AIRCRAFT		
*357	Nakajima Aircraft, Musashino Plant	With #356, estimated 15% engine production.	3b
*356	Nakajima Aircraft, Ogikubo Plant	With #357, estimated 15% engine production.	3b
539	Nakajima Aircraft, Tanashi Foundry	Key foundry for area aircraft industry.	3b
799	Mitsubishi Aircraft, Oimachi Plant	Important production engines, parts, instruments.	2b
327	Mitsubishi Aircraft, Shibaura Plant	Engines, parts.	2b
331	Tokyo Gas & Electric Engineering	Important production planes, engines, parts.	2a
919	Tokyo Measuring Instrument Works	Rptd largest instrument plant Far East.	3b
1393	Aeronautical Experimental Laboratory	Research, some plane production.	3c
[illegible]	Kanegafuchi Spinning Mill Company	Large, rptd converted to plane production.	2b
1395	Shoda Aircraft	Little known.	3b
368	Aeronautical Instruments	No details.	3b
332	Nakajima Seaplane Works	Little known.	2b
	AIRPORTS		
1405	Sunamachi Airport	Important, new.	3c
337	Haneda Airport	Large; also research & manufacturing.	3c
1411	Susaki Airport	Large, formerly commercial.	3c
1413	Shinagawa Airport	Land & seaplanes; paratroops, flight testing.	2c
	ARMS, MUNITIONS		
1331	Kayaba Engineering Co.	Oerlikon cannon, airplane parts, flotation gear.	2b
541	Oriental Otis Elevator Co.	Converted to bomb racks, gun turrets & mountings.	3b

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March, 1943

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TOKYO (Cont'd.)

Target No.	Target Name	Significance	Zone - Vulnerability
	ARMS, MUNITIONS (Cont'd.)		
366	Steam Engineering & Rolling Stock Mfg Co	Converted to ordnance, armored trains, tanks.	2b
1333	Nippon Typewriter Co	Converted to small gun parts.	3b
355	Army Provisions Depot	Depot near Ishikawajima Dockyard.	2a
	Koishikawa Arsenal Area (Targets 206-1335 below)	Heart of "Arsenal Area"; very important & large; targets through 1335 produce ordnance, ammunition, bombs, instruments & include major stores and Hq.	
206	Army Arsenal		2b
207	Military Gunpowder Wks		2b
208	Army Branch Powder Fcty		2b
209	Military Works		2b
203	Ordnance Supply Depots (Powder Magazines)		2c
202	Army Central Clothing [illegible]		[illegible]
219	Powder Magazine		2c
218	Ordnance Storehouses		2c
201	Ordnance Storehouse Ammunition		2c
217	Powder Fcty		2b
1335	Naval Gunpowder Works		2b
205	Army Arsenal and Military Gunpowder Works	Restricted area around #205 includes army ordnance supply, Tokyo #2 Army Arsenal, etc., producing ordnance.	2b
214	Armory	No details.	2a
352	Army Arsenal & Engineering School	No details.	2c
1332	Rolling Stock Company	Converted to tanks, ordnance.	3b
	AUTOMOBILES AND MOTORS		
573	Miyata Engineering Works	Motorcycles, aircraft parts, landing barge motors.	3b

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TOKYO (Cont'd.)

Target No.	Target Name	Significance	Zone - Vulnerability
	AUTOMOBILES AND MOTORS (Cont'd.)		
1341	Rikuo Engine Company	Motorcycles.	2b
883	Ikegai Motor Plant	Internal combustion engines.	2b
1340	Harley-Davidson Motorcycle Company	Large, builds motorcycles, sidecars.	3b
1342	Japan Machine Industry	Airplane & auto parts; rptd some aircraft assembly.	1a
1344	Japan Auto Company	Diesel engines, autos, airplane parts.	3b
	CHEMICALS		
1397	Japan Refining Works	General chemicals.	2b
1398	Tokyo Gas Co., Omori Branch	Large coking capacity.	2c
907	Tokyo Gas Co., Sunamachi Branch	Smaller branch plant.	2c
204	Japan Artificial Fertilizer	Rptd expanded; caustic soda, chlorine & by-products.	2a
1400	Hodogaya Soda	Branch of #1398.	2b
1401	Japan Artificial Fertilizer	Branch of #204.	2b
	COMMUNICATIONS		
1418	Marunouchi Telephone Exchange	Principal Tokyo exchange, jc all domestic & cable telegraph.	3c
363	Radio Sta JOAK	Japan's main broadcasting station.	3c
1419	Navy Department Towers	Receives messages from ships at sea.	3c
326	Factory #2 of Nippon Electric Co	With #497 largest communications equipment mfr.	2a
888	Oki Electric Company, Ltd Pl #1	Large electrical & communications equipment firm.	2b
826	Fujikura Electric Cable Works	Large & important production communications equipment.	2a
551	Fcty #1 of Medensha Electrical Equipment Co	Special importance; rptd making aircraft detection equipment.	2a
889	Fcty #3 of Nippon Electric Company	Specializes in Navy work.	2b
1421	Fcty #2 of Medensha Electrical Equipment Co	Transformers, electrical machinery.	3b

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TOKYO (Cont'd.)

Target No.	Target Name	Significance	Zone - Vulnerability
	COMMUNICATIONS (Cont'd.)		
1424	Central Meteorological Observatory	Important; military weather information.	3c
1430	Nippon Electric Wire and Cable Co	Important copper wire manufacturer.	2a
	ELECTRIC POWER		
230	Senju Steam Power Station	One of area's 5 largest - 77,000 Kw.	2c
213	Kinugawa Steam Power Station	Reserve plant for Tokyo tramways - 35,000 Kw.	2c
228	Government Steam Power Station	Important, supplies railways - 25,000 Kw.	2c
1345	Tokyo Municipality Steam Plant	Supplementary for tramways - 30,000 Kw.	2c
211	Inawashiro Transforming Station	Handles power from Key L Inawashiro hydro system.	2c
	HARBOR FACILITIES AND WAREHOUSES		
886	Hinode-cho Pier	New construction.	2a
887	Shibaura Wharf	Accommodates seven 8,000-ton ships.	2a
1434	Fukagawa Pier)	3 piers can handle 18 ships - 2,000 to 6,000 tons.	3c
1435	Tsukishima Pier)		3c
1436	Tsukishima East Wharf)		3c
1448	Tsukiji Market and Wholesale Warehouse	Important food distributing center.	2c
1449	Kanda Market	Supplements Tsukiji Market.	1a
1450	Koto Market	Supplements Tsukiji Market.	1a
885	Takeshiba-cho Pier	New construction.	2a
	IRON AND STEEL		
1348	Toho Steel Foundry Co	Produces alloy steels; electric furnaces, mills, foundries.	3b
336	Japan Special Steel Co	One of leading alloy-steel producers.	2b
1349	Japan Special Steel Wks	Electric furnaces for special steels; location not certain.	3b
1350	Tokyo Kozai Co	Medium size; electric furnaces.	2b

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TOKYO (Cont'd.)

Target No.	Target Name	Significance	Zone - Vulnerability
	IRON AND STEEL (Cont'd.)		
334	Nisso Steel Mfg Co	Absorbed 1938 by Nippon Soda KK.	2b
904	Sakurada Engineering Wks	Girders, pipes, boilers, chemical & RR equipment.	2a
328	Watanabe Steel Works	Group of small plants.	3b
1352	Steel Plants in NE Joto Ku	Four small steel plants.	2b
	MACHINES AND MACHINE TOOLS		
354	Shibaura Machine Tool Company	Lathes, grinders & abrasives, "jeeps".	2b
916	Hitachi Engineering, Kameido Plant	Important prod heavy industry goods, conversion to war goods.	2b
918	Niigata Iron Works	Machine tools, submarine motors, Diesel trucks.	3b
135	Japan Steel Bearing Co	Very important, with ¥1356 rated leading Japan bearing production.	2a
913	Hattori Company	Precision instruments, clocks, etc.	2a
1360	Ishii Iron Works, Ltd	Chemical equipment plant, also produces machine tools.	3b
1357	Tokyo Special Machine Mfg Co, Japan Physico-Chemical Co	Army and Navy precision tools.	3b
882	Ikegai Machine Foundry	Industrial machines, machine tools.	2b
1361	Kokusan Machinery Co	One of most important producers machine tools.	2b
1362	Kitashin Electric Engineering Co	Electrical & precision instruments.	3b
350	Tsugishima Machinery Company	One of many tool plants near Ishikawajima dockyard.	2a
1358	Riken Heavy Industry Co	Produces "Riken" car; probable war conversion.	2b
1364	Physico-Chemical Industries, Ltd	Abrasives, precision machinery.	2b
	NON-FERROUS METALS		
212	Asahi Electro Chemical Co	One of most important magnesium plants in Japan.	2b

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TOKYO (Cont'd.)

Target No.	Target Name	Significance	Zone - Vulnerability
	PETROLEUM		
911	Ogura Oil Company	Large.	2b
910	Rising Sun Petroleum Terminal	Secondary storage tank farm.	2c
360	Edogawa Petroleum Refinery	More data required.	3b
359	Uibar Oil Company	More data required.	2b
1366	Nippon Oil Company	Warehouses & storage.	2c
	NAVAL BASES AND SHIPYARDS		
330	Ishikawajima Dockyard of Ishikawajima Shipbldg & Engineering	Important engineering works, shipbuilding yard.	2b
1459	Susaki Dockyard of Ishikawajima Shipbldg & Engineering	At least one 20,000-ton drydock, 3-4 bldg slips, gantries.	3b
00044			
1462	Shinagawa Shipyard	Repairs merchant ships; 4 ways, 3000-ton drydock.	2b
912	Kurashiki Spinning Mill	Cotton thread and fabrics.	2a
914 & 915	Oriental Weaving Co Plants	Yarn, serge & muslin; probable war conversion.	2a
	TRANSPORTATION		
1368	Akabane Railroad Bridge & Junction	Control main line outlets N out of Tokyo.	3c
364	Shinagawa Railroad Yards	Rptd most important yard in area.	2a
370	Oi RR Works	Second most important shops IGR region.	2a
369	Ueno RR Station	One of 3 major Tokyo passenger depots.	3c
1374	Shinjuku Station & RR Jcs	One of three important Tokyo stations.	2a
1371	Arakawa River Bridges of Joban & Tobu Railroads	With #1370 controls outlet NE out of Tokyo.	3c
1372	Sumida River Bridge of Sobu RR; Ryogoku Bridge & RR Yard	Sobu RR E out of Tokyo; alternate for Joban line.	1c

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March, 1943

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TOKYO (Cont'd.)

Target No.	Target Name	Significance	Zone - Vulnerability
	TRANSPORTATION (Cont'd.)		
1373	Sobu RR Bridge, Arakawa River & Shinkoiwa Yd, Jc	With #1372 Sobu RR E out of Tokyo.	3c
367	Tokyo Central Station	Most important passenger station in area.	3c
365	Shiodome Freight Yds	Among most important yards in Tokyo vicinity.	2a
224	Tabata-Nippori RR Yards	Among most important yds in Tokyo vicinity.	2a
1370	Sumida River Bridge & Sumida River RR Yard of Joban Line	With #1371 controls chief outlet NE out of Tokyo.	2a
	MISCELLANEOUS		
880	Konishi Photo Works	Leading photo equipment manufacturer.	3b
1365	Japan Bakelite Co	Leading & one of few important plants in Orient.	2a

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Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March, 1943

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KAWASAKI

Population - 300,777 (1940).

Location - Between Tokyo and Yokohama, Latitude 35° 31' N., Longitude 139° 42' E.

Importance - Although Kawasaki is a large, politically independent city, it is in effect a highly industrialized suburb of Tokyo. As a result of the development of its heavy industries, the city has grown rapidly in the past decade, the population having more than doubled. Its major industries are:

1. Oil refineries (three major refineries having over 10% of the capacity of all the Japanese-controlled refineries).
2. Electrical equipment (largest radio-telephone plants in Japan; important electrical equipment of all kinds).
3. Iron and steel (two major plants, of which the larger ranks third among all Japanese steel plants).
4. Machines and Tools (site of huge Shibaura Engineering Works, large producer of heavy electrical equipment, machinery, tools and munitions).
5. Rubber Tires (approximately 20% of total Japanese capacity).
6. Chemicals (fertilizers and basic chemicals).

Located on the waterfront are three large and several small steam power plants which generate virtually all the steam power used in the Tokyo area. The city is also a major railway transportation corridor, lying astride the busiest portion of the Tokaido Main Line.

General Description - The heavily built-up part of Kawasaki city is confined to a triangular area bounded by a huge railroad shunting yard on the east, the Tama River [illegible] Industries extend northwestward for three [illegible] miles along the Tama River. With the exception of the large factories on the waterfront and a few public and commercial buildings, the city has relatively few substantial structures. The influx of over 100,000 persons during the past 10 years has led to a mushroom growth of cheap workers' homes, most of them concentrated just west of the bulge of the Tama River. A second concentration of residences is found just inland from the waterfront, in the Tsurumi district. While this district is politically a part of Yokohama, it is included here with Kawasaki since it constitutes a geographical extension of that city. Concentrated on Kawasaki's reclaimed waterfront are some of Japan's most vital munitions plants.

Fire Areas - Two fire areas are designated.

Zone I - Zone I, located west of the bulge of the Tama River, covers the most congested part of the city. This is a predominantly residential area, with numerous small factories along the Tokaido Railroad. Also along the railroad are Plants #1 and #2 of the important Shibaura Electric Co., key producer of electrical equipment of all kinds. The city's commercial district is located along the southern part. The elevated Tokaido Railway constitutes the only major firebreak.

Zone II - Zone II covers the densely built-up Tsurumi district, covered with Kawasaki's cheapest workers' homes. Kawasaki's largest factories are located on the waterfront, just south of this fire area. These factories are modern structures, many of reinforced concrete. Generally speaking these plants are not vulnerable to incendiary attack. Within Zone II, however, are located the key Yokohama Rubber Co. and several chemical and machinery plants.

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KAWASAKI



Recent view of Kawasaki, looking SSE, covering section in old view above hidden by plane wing. Indistinct mass of dark structures are cheap homes built to accommodate large influx of workers in recent years. Large factories on waterfront visible in distance.



Old view of Kawasaki, look ESE. The population has more then doubled since this view was taken and congestion has increased accordingly. Large buildings in center are power stations and radio equipment plants. Other factories now located on other side of RR.

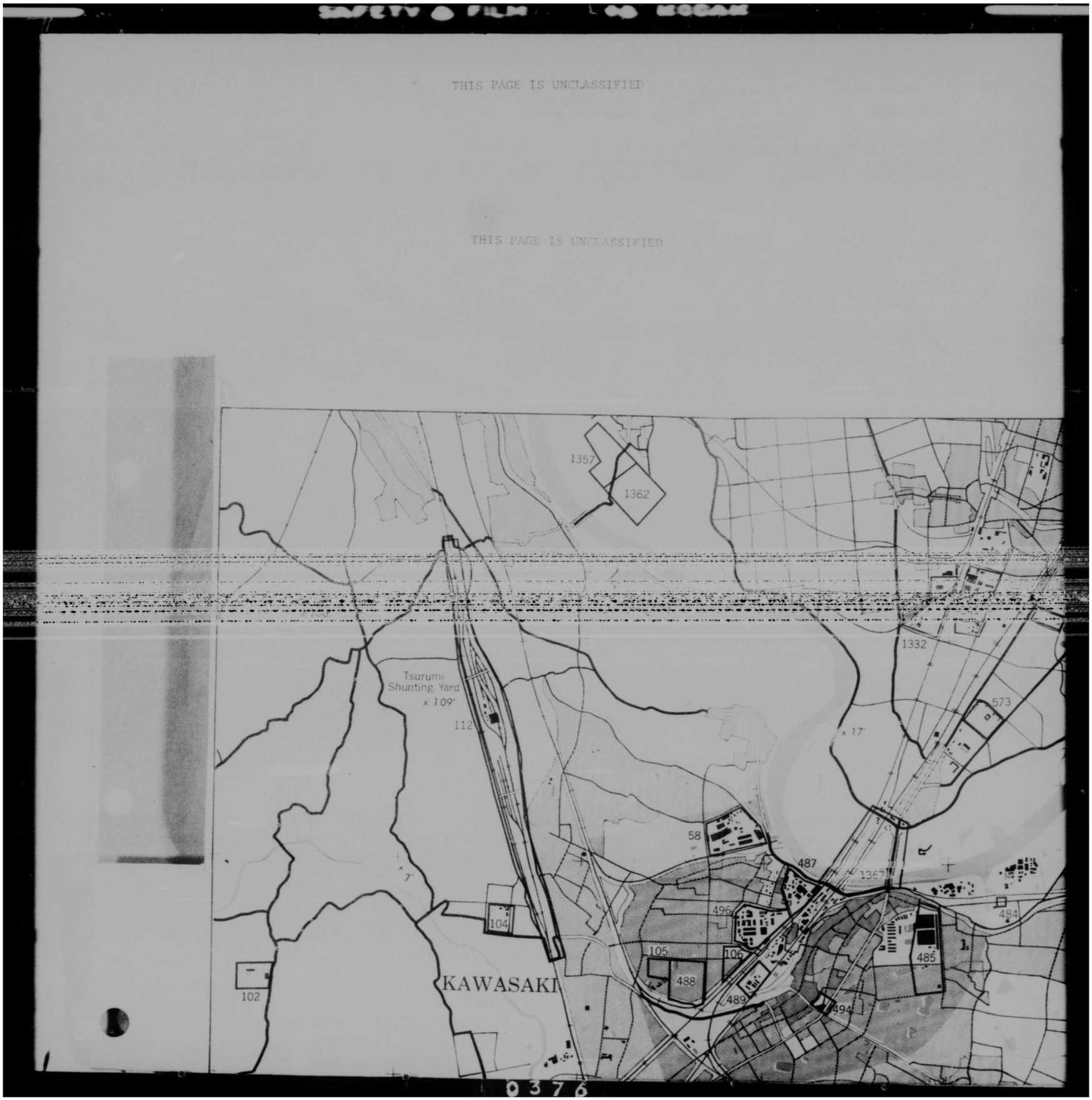
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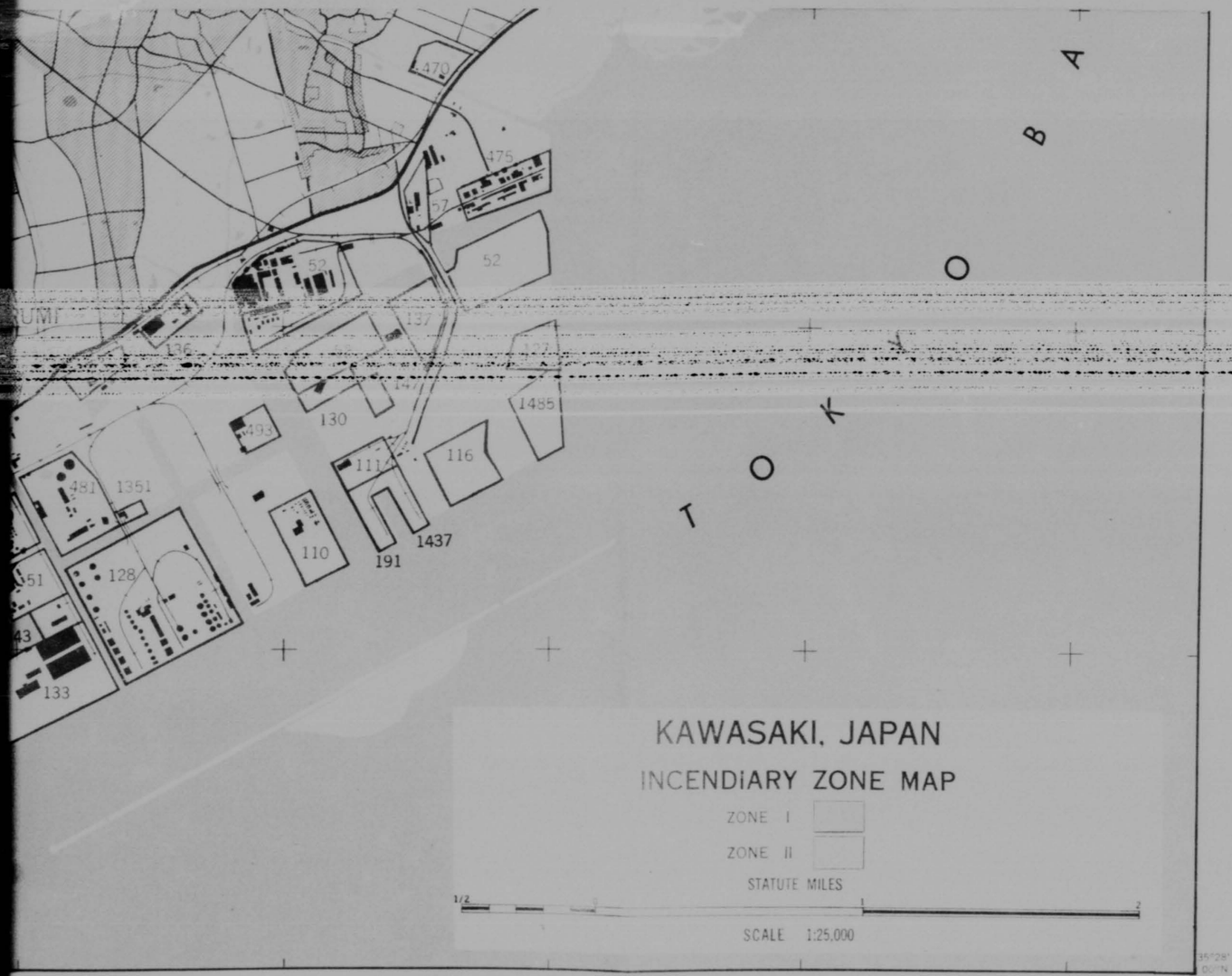


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KAWASAKI, JAPAN

INCENDIARY ZONE MAP

ZONE I

ZONE II

STATUTE MILES

1/2 0 1 2

SCALE 1:25,000

OFFICE OF THE ANT CHIEF OF AIR STAFF, INTELLIGENCE WASHINGTON, D. C.

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FOR TARGET DETAILS SEE A/B OBJECTIVE FOLDER TOKYO AREA – NO. 90-17, ISSUED SEPT. 15, 1943

35°28' 00"N

139°46' 30"E

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SELECTED TARGETS IN KAWASAKI CITY

Source: Air Obj. Folder, No. 90.17, Tokyo Area

Target No.	Target Name	Significance	Zone - Vulnerability
	ARMS, MUNITIONS		
142	Unidentified Arms Plant	Guns, aircraft motors.	3b
1337	Tsurumi Army & Navy Stores	Rptd tarpaulin-covered stores, heavily defended.	3c
	AUTOMOBILES AND MOTORS		
1343	Ishikawajima Motor Co.	Military vehicles, Diesel engines, gun carriages.	3b
135	Coop Auto Works	Secondary auto plant.	3b
	BUILDING MATERIALS		
475	Asano Cement Company	Secondary.	3b
	CHEMICALS		
137	Showa Fertilizer	Vital importance; one of largest in Empire.	3b
479	Japan Artificial Fertilizer	Important; nitrogen fixation, other chemicals.	3b
[illegible]	[illegible] Glass Company	Glass products of all kinds.	3b
481	Tokyo Gas Company, Tsurumi Branch	Most important branch Tokyo Gas Company.	3c
	COMMUNICATIONS		
497	Factory #1 of Nippon Electric Company	With #326 largest communications equipment mfr.	3b
496	Factory #1 of Tokyo-Shibaura Electric Co.	Major radio-telephone equipment plant.	1b
488	Factory #2 of Tokyo-Shibaura Electric Co.	Major radio-telephone equipment plant.	1b
109	Oki Electric Co Plant #2	Former main plant.	3b
484	Showa Wire Cable Co.	More data required.	3b
494	Tokyo Electric Wire & Manufacturing Co.	Important manufacturer copper & brass wire.	1a
132	Kawasaki Naval Wireless Station	No details.	3c
489	Nippon Electric Wire & Cable	Important wire & cable plant.	1a

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March, 1943

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KAWASAKI (Cont'd.)

Target No.	Target Name	Significance	Zone - Vulnerability
	COMMUNICATIONS (Cont'd.)		
136	Fuji Electric Works	High tension power equipment.	3b
	ELECTRIC POWER		
110	Tokyo Electric Power Generating Station, Tsurumi Plant	One of area's 5 largest - 178,000 Kw (1936).	3c
111	Kawasaki Electric Power Plant for Japanese Government Railways	Large, chief power source for Gov't railways of area.	3c
493	Tokyo Steam Power Plant	One of area's 5 largest - 70,000 Kw.	3c
105	Kawasaki Substation #1	Important switching & transforming station.	1c
470	Tokyo Electric Power Station	Medium size.	3c
106	Railroad Transformer Station	Government railway station.	1c
104	Nippon Electric Power Transforming Station	Secondary Substation.	3c
	STORAGE		
191	Mitsubishi Coal Depot	Only large coal depot in Kawasaki-Yokohama.	3c
1437	Mitsubishi Piecegoods Wharf & Warehouses	Handle war supply shipments.	3c
1485	South Manchurian Wharf and Warehouses	Large, has two travelling cranes.	3c
	IRON AND STEEL		
52	Japan Steel Tube Co.	Rated most important steel plant in area.	3b
51	Asano Iron Works	Iron, steel; supplies Tsurumi Steel and Shipbuilding.	3b
56	Fuji Steel Works of Imperial Iron & Steel	One of large plants.	3b
1347	Japan Service Company	Stainless steel, rolling & forging.	3b
57	Oriental Steel Products Co.	Specializes in structural steel.	3b
58	Tokyo Special Steel & Chrome Works	Special steels, aircraft and auto parts.	3b
1351	Tokyo Nakayama Iron Works	Zinc & iron products.	3b

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KAWASAKI (Cont'd.)

Target No.	Target Name	Significance	Zone - Vulnerability
	MACHINES AND MACHINE TOOLS		
133	Shibaura Engineering Works, Ltd.	Vital importance; electrical equipment, navy turbines, munitions.	3b
	NAVAL BASES AND SHIPYARDS		
122	Tsurumi Steel and Shipbuilding Co of Asano Corp.	Ocean-going tankers, other ships; rptd also cruisers.	3b
	PETROLEUM		
*116	Mitsubishi Oil Refinery	Japan's largest; produces aviation gasoline, lubricants.	3b
128	Petroleum Center	Four refineries & storage, aviation gasoline etc.	3c
127	Hayama Petroleum Refinery	One of area's largest refineries.	3b
147	Aikoku Petroleum Refinery	Fairly large.	3b
130	Asaishi Petroleum Co.	Oil & gasoline.	3b
129	Nippon Super Fuel Co.	Small output gasoline by coal liquefaction.	3b
117	Mitsubishi Oil Co. Ltd. Uriyoda Oil Tanks	Production & storage.	3b
	RUBBER		
*141	Yokohama Rubber Company	Rptd 2nd most important rubber target Far East.	2b
	SUGAR		
487	Meiji Sugar Factory	Beet sugar plant; rptd large alcohol expansion.	1b
	TEXTILES		
485	Fuji Spinning Mills	Indeterminate importance.	1a
	TRANSPORTATION		
1367	Tama River Bridges	Possibly area's most vulnerable RR bottleneck.	3c
1369	Tsurumi River Bridges	Only outlet S from Tokyo & Kawasaki except #1367.	3c
112	Tsurumi Shunting Yard	Most important yard in Kawasaki.	3c

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March, 1943

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SECRET

YOKOHAMA

Population - 968,091 (1940).

Location - Western side of Tokyo Bay, Latitude 35° 27' N., Longitude 139° 38' E.

Importance - In peacetime, Yokohama was Japan's leading commercial port. In recent years, the city had also become a major industrial center, its industries constituting an extension of those in Tokyo and Kawasaki. The principal industries are oil refineries, shipyards, automotive, munitions and ordnance, chemicals and alumina. A moderate sized aircraft engine factory is reported to be located a few miles south of the city. The city's great warehouses, now partly unused due to cessation of commercial transport, are probably utilized for storing military goods of all kinds.

Yokohama is an important transportation center. The vital Yokohama-Tokyo RR line leads along the waterfront to the harbor, passing through some of the most congested parts of the city. Private electric lines parallel the main line. The city is an important military trans-shipment point.

General Description - The city proper occupies a "V"-shaped site, in a valley which opens toward the bay. Low hills and bluffs border this valley. The city has expanded rapidly in recent years and numerous settlements are now located in the valleys across the hills which flank the city proper. The city is cut-up by numerous canals and rivers, and by wide streets and multi-track railroad lines. These breaks, many of which constitute effective fire breaks, enclose dense clusters of inflammable structures flanked by [illegible] completely rebuilt after the earthquake and fire of 1923, and its waterfront commercial district [illegible]

[illegible] Because the city is elongated [illegible] bluffs, its overall population density is relatively low. However, the target areas covered by Zones I and II (see below), are about as vulnerable to incendiary bombing as those of other large cities.

The pattern of land use is fairly regular. The commercial district is concentrated in the eastern part of the city proper and extends down to the warehouse district near the main piers. Here are located virtually all the public buildings as well as large business offices. To the east and NE is a large district of warehouses, wholesale houses and large stores. To the west is the heart of the city proper, a predominantly residential area. The industrial zone stretches northward along the waterfront toward Kawasaki with a spur bending southwestward along a valley from the main Yokohama RR Station. Some of Yokohama's most congested workers' quarters stretch along the railroad line toward Kawasaki city. A region of better spaced residences stretches along a valley across the Yamate bluff on the SE side of the city proper.

Fire Areas - Three areas are indicated as suitable for incendiary attack.

Zone I - Zone I covers the center of the city proper, a triangular area congested with residential and mercantile structures. This is the most densely populated region in the city, and according to fire insurance ratings, the highest in fire hazard. Dense clusters of wooden residences,

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broken only by narrow streets, extend inward from the numerous fire breaks (wide streets and canals). The northern and western parts of this district, covered with cheap native shops and theaters, are especially inflammable. With the exception of such public buildings as schools, police stations, etc., the prevailing construction is wood. There are no large factories in this zone and comparatively few small household shops.

Zone II - Zone II comprises two separate fire areas.

The larger portion of Zone II consists of a long, narrow strip extending northward along the waterfront from the Yokohama Port area almost to the Tsurumi River. This is a mixed residential/industrial region, with most of the city's heavy industry along the waterfront and cheap workers' homes along the railroad lines. While there are many open spaces (near the railroad and factories), much of this area is densely built-up with inflammable structures.

The central part of this area, just NW of the Yokohama Station, is covered with saw mills and lumber storages interspersed among workers' homes. A cheap mercantile district extends through the middle of the area, between the Tokyo-Yokohama RR and the industrial belt along the waterfront. Workers' homes extend along the railway lines and inland to the foot of the flanking hills and into the valleys. The northernmost part is a residential area with numerous small factories and stores. Located along the waterfront, within the boundary of this area, are such industries as oil refineries, automotive, chemical and machinery. Also located here are oil tank farms, large warehouses and a steam power plant. Factories, foundries, shipyards, and chemical plants.

[redacted] also covers the nerve center of Yokohama's vital railway system. The southern part of this area covers the commercial, warehouse and best mercantile district of the city. Most conspicuous are the western-type commercial structures, housing some of the largest business offices as well as wholesale and retail houses. These are the most fire-resistive structures in the city, approximately 50% being of "fireproof" construction. Just to the east are Yokohama's great warehouses and storage sheds, some of them of inflammable construction, and most of them housing combustible materials. The entire southern part of this area is well-zoned, with wide streets and canals and only occasional congestion. The northern part, however, ranks second in fire hazard only to Zone I. Here are located the huge Takashima RR Freight Station, the Yokohama Passenger Station and a large area of inflammable storage sheds. Extending westward into two valleys are workers' homes, cheap mercantile districts and a central industrial belt, the site of electrical equipment, chemical and textile plants. The western outskirts of the area cover better constructed and well-spaced residential districts. Located along the waterfront, on the border of this area, is the huge Yokohama Dockyard.

The second part of Zone II covers a residential settlement located on the south side of the Yamate bluff, south of the city proper. This is an area of congested dwellings and mercantile buildings, moderately inflammable and with few effective fire breaks.

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YOKOHAMA



Looking SW into the residential section of Yokohama, Zone I. Large buildings in center are part of city's well-zones, fire-resistant commercial district, Zone II. At lower left is part of warehouse area. Yokohama Dockyard (Target 69) is seen at lower right.



Detail of residential section of Yokohama proper. Note that, while city blocks are congested, there are numerous effective fire breaks.

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View of Zone I in northern part of Yokohama proper, with part of Zone II in background. Note that houses form a solid mass in each block. These streets would probably not act as effective fire breaks. Large waterfront factories are visible at upper center.

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YOKOHAMA



Looking south over Yamate Bluff and the southern residential section of city, Zone II.



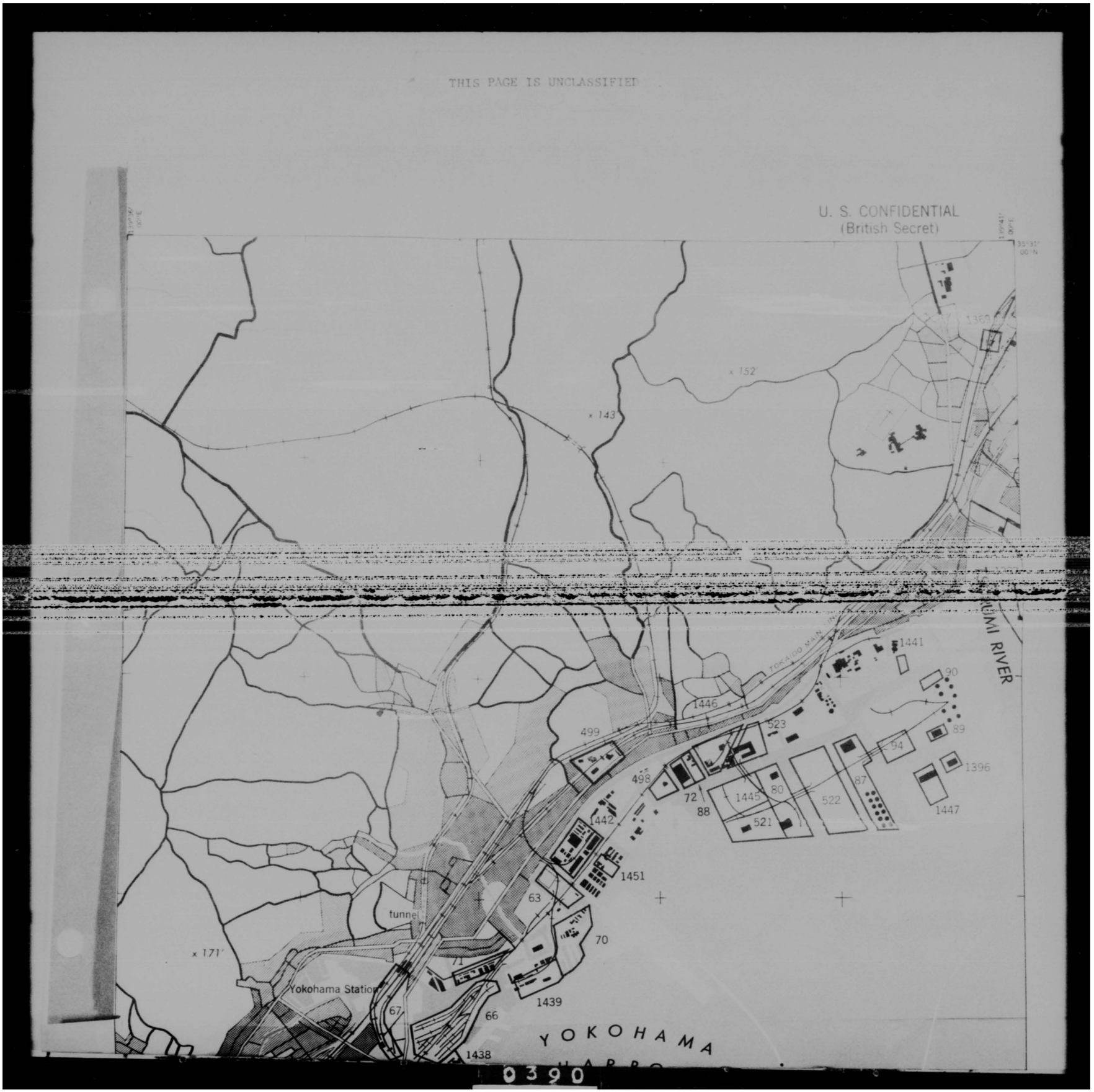
Looking north across mixed industrial/residential section of city. Several shipyards, RR freight yards and miscellaneous factories are located along the waterfront (Targets 66, 71, 70, 63, 67). In the foreground are city gas works, lumber storages and electrical equipment factories. Residences extend into valleys at left.

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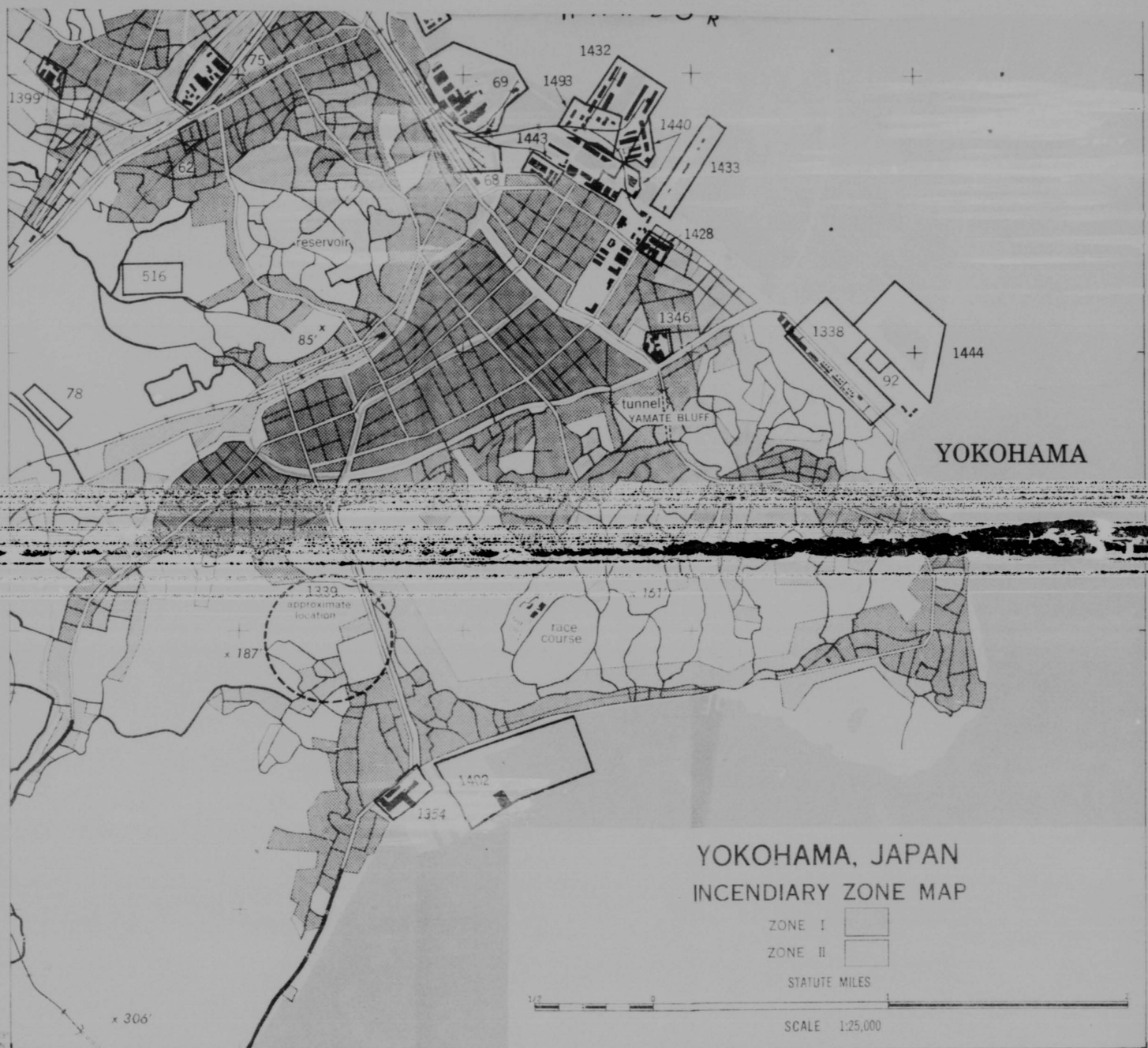
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SEPTEMBER 1943

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OFFICE OF THE
ASSISTANT CHIEF OF AIR STAFF, INTELLIGENCE
WASHINGTON, D. C.

FOR TARGET DETAILS SEE AIR OBJECTIVE FOLDER
TOKYO AREA—NO. 90.17, ISSUED SEPT. 15, 1943

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SELECTED TARGETS IN YOKOHAMA CITY

Source: Air Obj. Folder, No. 90.17, Tokyo Area

Target No.	Target Name	Significance	Zone - Vulnerability
	AIRPORTS		
1402	Yokohama Naval Air Station	Flying boat patrols.	3c
	ARMS, MUNITIONS		
498	Kurada Iron Works	Builds steel hulls.	2b
78	Nirada Firecracker Factory	Rptd converted to munitions.	3b
1338	Inflammable Storage Docks	Powder and/or gasoline, low warehouses in fire area.	3c
1339	Ammunition Storage	Storage in hill.	3c
515	Three Powder Magazines	In low hills.	3c
516	Powder Magazine	No details.	3c
	AUTOMOBILES AND MOTORS		
*522	[redacted]	[redacted]	
72	Ford Motor Company	Light trucks, tanks, probably ordnance.	2c
	CHEMICALS		
1396	Tsurumi Soda Company	New, probably enlarged; by-product chlorine.	3b
499	Nippon Carbon Company Factory #1	Largest unit principal Jap producer carbon electrodes.	2b
80	Niigata Sulphuric Acid Company	Large, new, built by U.S. technicians.	3b
1399	Hodogaya Soda	Rptd one of important chemical targets in Empire.	2b
	COMMUNICATIONS		
1426	Yokohama Telephone Exchange #1	Largest in Yokohama.	2c
75	Furukawa Electric Co. Plant #1	Important production telephone-telegraph wire, accessories.	2a
523	Japan (Radio) and Phonograph Company	Converted to war communications.	2a
	ELECTRIC POWER		
63	Kanagawa Steam Power Plant	One of 5 largest in area - 21,500 Kw.	2c

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March, 1943

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YOKOHAMA (Cont'd.)

Target No.	Target Name	Significance	Zone - Vulnerability
	ELECTRIC POWER (Cont'd.)		
62	Hodogaya Substation	Important.	2c
1346	Yokohama Electric Light Company	Serves Yokohama residential section.	2c
	HARBOR FACILITIES AND WAREHOUSES		
1432	Yokohama Harbor Passenger Wharves	Can handle 50,000-ton ships.	2a
1433	Yokohama Main Pier	Largest pier in Yokohama	3c
1438	Kyoritsu Warehouse	Stores frozen foods.	2c
1439	Yokohama Central Wholesale Market	Stores fresh food and fish.	2a
1440	Mitsubishi Warehouse	Handles war supplies.	2a
1441	Yokohama Warehouse (North)	Important storage.	2a
	(South)	Important storage.	2a
	Conditioning House		
1444	Yokohama Harbor Timber Basin	Large.	3c
1445	Yokohama Harbor Company Operative Purchasing Co. Warehouses	Important warehouses.	2e
1446	East Asia Development Company Warehouses	Present use unknown.	2a
1447	Hiraidzumi Drug Depot	Present use unknown.	3c
1451	Naniwa Warehouse	Present use unknown.	2a
1493	Toshin and Shinko Whses	War shipping.	2a
	MACHINES AND MACHINE TOOLS		
1354	Oriental Babcock Company	Important; boilers, other heavy industry goods.	3b
	NON-FERROUS METALS		
521	Japan (Showa) Electro Chemical Company	One of most important alumina plants in Japan.	3b

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March, 1943

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YOKOHAMA (Cont'd.)

Target No.	Target Name	Significance	Zone - Vulnerability
	PETROLEUM		
*87	Ogura Oil Company	Large refinery & tanks.	3b
90	Oriental Oil Company	Oil & gasoline.	3b
89	Eastern Petroleum Refinery	Oil & asphalt.	3b
88	Japan-American Oil Company	Fuel oil, gasoline, kerosene; small.	2a
92	Lighthouse Bureau Oil Tanks and Kanagawa Gasoline Tanks	Petroleum stores & military supplies.	3c
94	Matsukata Oil Storage	Petroleum & gasoline storage.	3c
	SHIPYARDS		
*69	Yokohama Dockyard	One of largest in Japan.	2b
70	Asano Dockyard	Almost entirely a repair yard.	2b
[illegible]	[illegible]	[illegible]	2b
	TRANSPORTATION		
[illegible]	[illegible]	[illegible]	2a
67	Junctions, Overpass	Chief passenger concentration in Yokohama.	2c
68	Higashi Yokohama Yard	Second most important yd in Yokohama.	2a

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued, March 1943

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OSAKA

Population - 3,252,340 (1940).

Location - At NE head of Osaka Bay, Latitude 34° 41' N., Longitude 135° 45' E.

Importance - Recent prewar statistics indicated that Osaka ranked second only to Tokyo as a manufacturing center. In peacetime, it was also Japan's leading trade and commercial city. Among the most important war industries now located here are: ordnance arsenals, machines and machine tools, steel and other metal alloys, chemicals, shipbuilding, textiles and food processing. In addition to the larger industrial plants, there are several thousand small factories, the total production of which is significant. In 1938, for example, 15,677 factories (employing 5 or more persons) were listed in the city. Located in neighboring towns (such as Akashi, Nishinomiya, Sakai and Wakayama) are aircraft, metal and chemical plants which depend on Osaka for components and for some of their workers.

Osaka is also one of Japan's vital transportation centers. Located at the heart of Japan's main island, it is a center of land and sea traffic, and an important terminal for military supplies. Not only is Osaka an important station on the Tokaido Line, but it is also the terminus of an alternate line to Nagoya (Kansai Line) and of a line to Tsuruga, main military port on the Japan Sea. Numerous electric lines connect it with the neighboring towns.

Osaka is the capital of Osaka Prefecture, and the seat of its civil and military administration.

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General Description - Osaka stands on level delta land formed by the Yodo River and its numerous tributaries. Many canals criss-cross the city, especially in the central part where they form regular rectangular patterns, giving rise to its name as the "Venice of the Orient." Conspicuous landmarks, in addition to the rivers, canals and waterfront, are Nakanoshima, a long island in the Aji River (site of many government buildings), Osaka Castle just to the SE and the modern commercial district in the heart of the city.

There is a distinct pattern of land use. The predominantly residential districts are located in three parts of the city, the largest of which occupies the entire southeastern part. The second residential district stretches along a thin strip on the north bank of the Yodo River. The third and more open residential district is located in the northernmost part of the city. The commercial district, marked by clusters of western-type buildings, occupies the center of the city - an area intersected by many canals. The principal industries are concentrated in a semi-circular area, starting from the mouth of the Yamato River on Osaka Bay to the south, running NW along the waterfront to the Yodo River and then bending eastward along both banks of that river. Another industrial area is located to the east of Osaka Castle. This regular pattern is broken by the frequent interspersion of workers' homes among industrial and commercial buildings.

Osaka is one of Japan's most densely populated cities, ranking about third in this respect. According to the calculations made in this study, the average population density of Zone I is 81,000 persons per square mile while that of Zone II is 60,000. The overall density of Zones I and II combined is 64,000 persons per square mile.

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Osaka (Cont'd.)

Population density and susceptibility to conflagration are highly correlated. According to fire insurance ratings, the areas which rate highest in fire hazard are located just south and west of the central business district. Other areas of high fire hazard are located in the fork of the Yodo River (just NE of the Osaka Railroad Station) and just SE of Osaka Castle. These districts are all within the area of greatest population density, and they include both industrial and residential zones.

As mentioned above, Osaka is a vital transportation corridor and its industries are absolutely dependent on the functioning of this transportation. The city's most important railroad stations and freight yards are located in areas where population density and fire hazard are high, and the main railroad lines pass through the most congested areas. The main port facilities and warehouses adjoin a congested and inflammable area and constitute important objectives for incendiaries.

To a greater extent than in most cities the areas of greatest congestion and inflammability are also the sites of important industries. Most of the larger industries tend to concentrate along the upper Yodo River where population density and fire hazard are high. Moreover, thousands of smaller factories are scattered along the periphery of the main industrial belt, in the midst of the most congested and inflammable parts of the city.

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Fire Areas - As indicated on the accompanying map, there are five fire areas in Osaka.

Zone I - Zone I covers the commercial district in the heart of the city, as well as an important industrial district near the waterfront and a congested residential/industrial area in the fork of the Yodo River. The central portion of this zone covers not only the commercial district (with its heavy concentration of business offices, retail and wholesale establishments, etc.) but also the local and prefectural government offices.

The southern and western parts of this zone cover a mixed industrial/commercial/residential area, where both population density and fire hazard are the highest in the city. Located in this part of the zone are such important industries as copper, aluminum and steel alloy plants, machine and tool plants, automobile and aircraft parts factories and chemical plants. The northeastern tip of this zone covers a mixed residential/industrial area, the site of one of Japan's largest copper refineries and fabricating plants, as well as several machinery and small arms plants and textile mills. The Osaka Station, Osaka's main passenger station is also located in this district.

In addition to the individually important plants mentioned, there are scattered along the SW and N parts of this area hundreds of small factories, an electric car barn, the city's gas works, central post and telegraph offices and the huge Osaka central food market.

Zone II - Four fire areas comprise Zone II.

The western area, along the waterfront, includes the important port area, congested with warehouses. Within this part of Zone II the roof coverage is greatest in the district immediately east of the Osaka piers (an area of warehouses, wholesale establishments, workers' homes, and industrial plants). Among the most important industries in this area are a steel plant, machines and tools, oil refineries and storages, shipyards,

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Osaka (Cont'd.)

automotive (partially converted to munitions), chemicals and a power plant. Several freight yards, important for trans-shipment of land-sea cargo, are also located in this area.

A second part of Zone II stretches along the south bank of the Yodo River. This is primarily an industrial area. While not as congested as the part of the city just to the SE, it is the site of many combustible structures, particularly along the river bank where wooden and sheet metal warehouses extend in a solid mass. Several large industries are located here, among which are locomotives works (at least partially converted to heavy ordnance), machine and tool plants, several heavy chemical and dyestuff plants, aluminum and other metal alloy plants, and a shipyard.

A third part of Zone II extends along the north bank of the Yodo River. This is primarily a residential area, with dense clusters of workers' homes near the river and an industrial belt to the north. Principal industries found here are textiles, steel and aluminum fabricating plants and several machinery plants. An important connecting spur of the Tokaido RR line passes through the most congested part of this area.

The fourth and largest part of Zone II extends along the eastern side of the city, from the Yodo River to the north to the more open residential district in the SE. This is a mixed residential/commercial/industrial area, with most of the industries in the northern half. In addition to the Osaka arsenal, one of Japan's largest automatic arms and mechanized equipment arsenals, there are five or six other arms factories producing small arms and components. Military barracks and headquarters are located near the Castle. The most congested part of this area is to be found just south of the Castle. Several large commercial buildings dot this district. The southern part of the area is predominantly residential becoming more open to the SE. The Kansai RR line and a spur of the Tokaido line pass through the most congested part. There are about five freight and passenger stations of which the Tennoji, to the south, is the most important.

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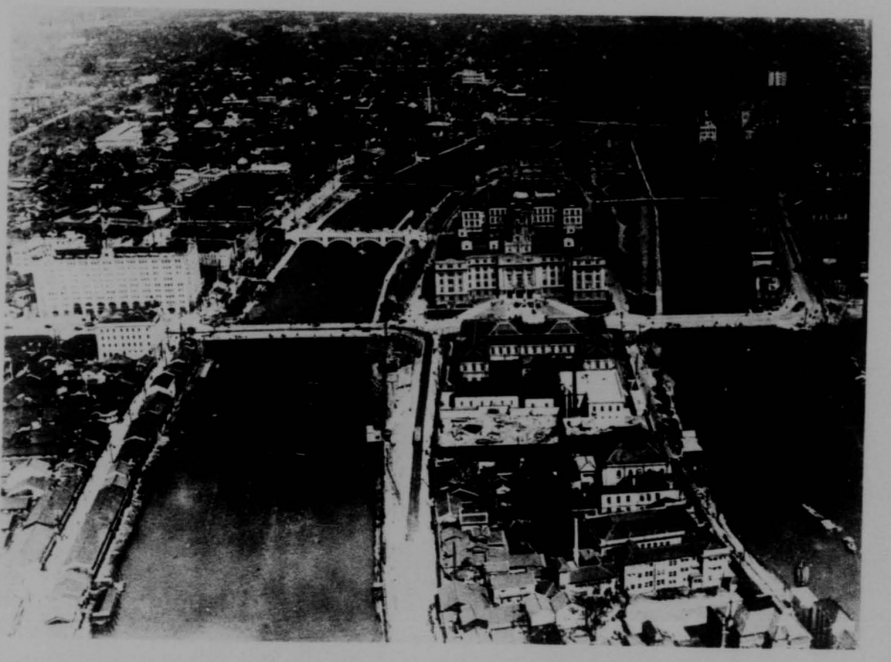
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OSAKA



Part of the commercial district in center of city. Note the interspersion of inflammable structures among larger, more fire-resistant buildings.



Looking east over government buildings on Nakano Island. Crowded residential district at left is typical of Zone I fire area in northern Osaka.

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OSAKA



Detail of small factories in northeastern Osaka, Zone II. Note absence of fire breaks of any kind.



Looking NE across Aji River into factory zone in northern Osaka, part of the Zone II fire area.

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OSAKA



Looking east along Aji River in Zone II industrial area. City gas works and an oil storage are visible in upper left. Factories and warehouses on right side of river are typical of industrial districts near waterfront of Osaka.



View of tramway car barns in southern Osaka. View looks north along a wide avenue, showing typical congestion on either side of the "conflagration stop". Large factories are visible on horizon and a fire observation tower is seen at upper right. Zone I.

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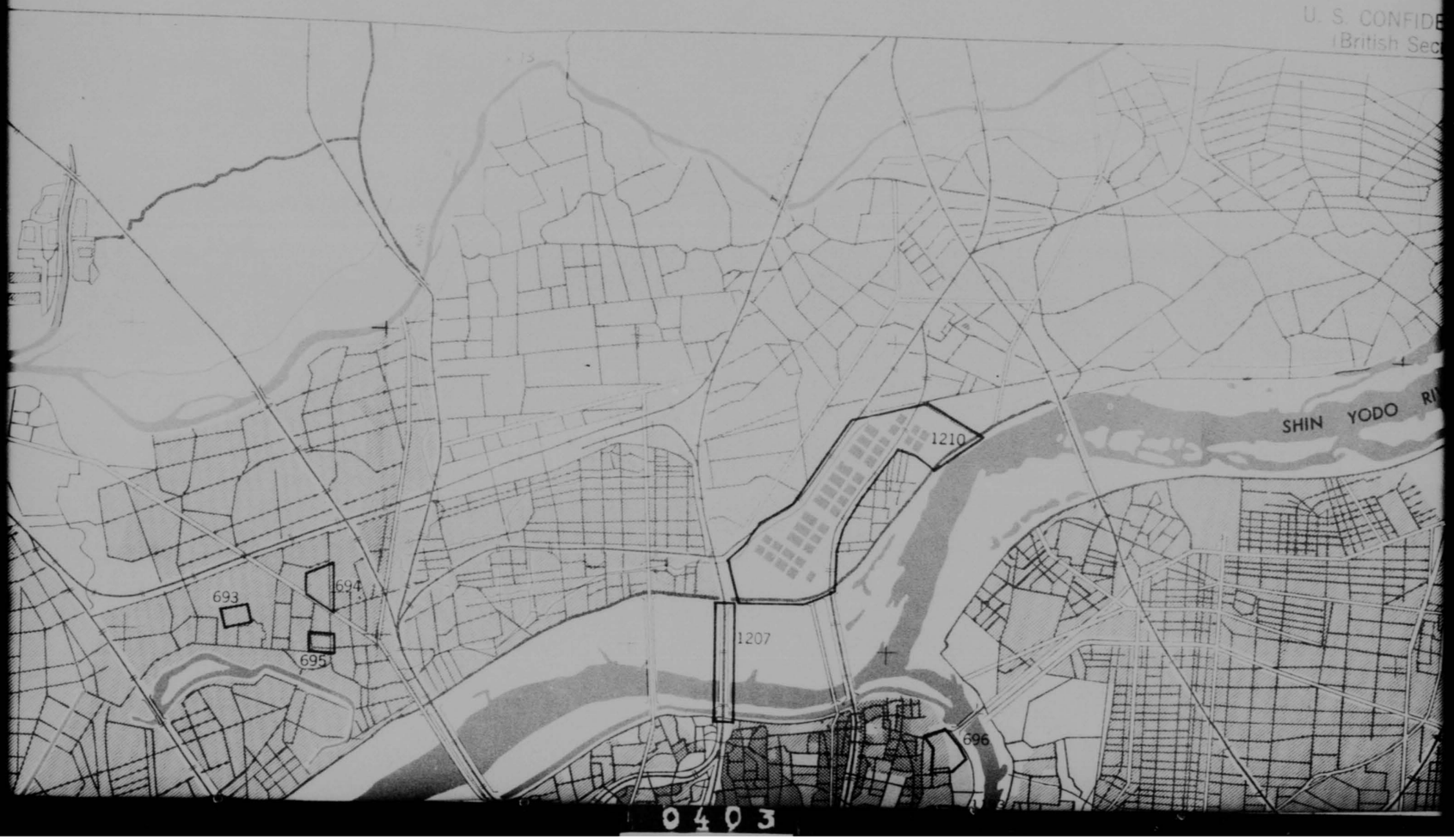


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ncies only Not for sale or distribution

FOR TARGET DETAILS SEE AIR OBJECTIVE FOLDER
OSAKA AREA—NO. 90.25, ISSUED MARCH 1, 1943.

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SELECTED TARGETS IN OSAKA CITY

Source: Air Obj. Folder, No. 90.25, Osaka Area, Issued March 1, 1943

Target No.	Target Name	Significance	Zone - Vulnerability
	AIRCRAFT		
793	Fukada Light Airplane Co, Ltd	Light planes, gliders.	3b
	AIRPORTS		
1187	Osaka Airdrome	Substantial.	3c
	ARMS, MUNITIONS		
385	Asahi Communications and Arms Factory	No details.	1a
386	Kawaka Electric Machinery Company	Projectiles.	2a
387	Kyohan Arms Manufacturing Company	No details.	2b
388	Osaka Machinery Company (Arms)	No details.	2a
389	Sonobe Iron Works	Army & Navy ordnance.	2b
390	Taido Metal Works (Arms)	Rptd war conversion, no details.	2a
391	Toyo Machinery Company	Ordnance, no details.	2a
392	Toyokuni Machinery	Arms & aircraft parts.	1a
393	Iron Works for Army and Navy	No details.	2b
384	Asahi Arms Factory	No details.	1a
548	Locomotive Mfg Company	Large, rptd converted to ordnance.	3b
645	Osaka Zoki Company	Arms, munitions & machinery.	2b
382	Osaka Arsenal	One of most important arsenals.	2b
	AUTOMOBILES AND MOTORS		
643	Osaka Kotsu Auto Mfg	More data required.	2a
1189	Nissan Jidosha	Cars, trucks, busses.	2b
1190	Teikoku Rivet Company	Auto parts.	2a
1192	Osaka Al Seisakusho	Auto parts, machines & aircraft.	1a
	CHEMICALS		
383	Dai Nippon Celluloid Fcty	Rptd large producer explosives.	3b

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March, 1943

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OSAKA (Cont'd.)

Target No.	Target Name	Significance	Zone - Vulnerability
	CHEMICALS (Cont'd.)		
547	Nihon Glycerine Factory	More data required.	3b
587	Kobe Acetic Acid Company	More data required.	3b
591	Lto Acid Factory	More data required.	3b
615	Sulphuric Acid Plant	More data required.	3b
625	Aoki Chemical Works	More data required.	1a
642	Osaka City Glycerine Co	More data required.	2a
647	Sumitomo Chemical Industry	Important; ammonia & phosphate.	1a
	ELECTRIC POWER		
322	Kasugade No 1 Steam Power Plant	Important - 50,000 Kw.	1c
323	Kasugade No 2 Steam Power Plant	Important - 65,000 Kw.	1c
324	Fukuzaki Steam Power Plant	Important - 40,000 Kw.	2c
325	Kizugawa Steam Power Plant	Important - 100,000 Kw.	2c
	HARBOR FACILITIES AND WAREHOUSES		
53	Osaka Harbor	One of Japan's important harbors.	2a
	IRON AND STEEL		
264	Sumitomo Steel Works No. 1	Important; castings, forgings, special steel.	3b
266	Sumitomo Steel Works No. 2	More data required.	2a
267	Asai Iron Works	More data required.	2a
268	Osaka City Steel Works	Important, open hearth furnaces.	3b
269	Aikoku Steel Works	More data required.	3b
270	Lto Steel Works	More data required.	3b
271	Nakagawa Iron Works	More data required.	3b
684	Umebachi Iron Works	More data required.	3b
685	Kurimoto Iron Works	More data required.	2b
686	Osaka Metal Works Co.	More data required.	2a

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March 1943

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OSAKA (Cont'd.)

Target No.	Target Name	Significance	Zone - Vulnerability
	IRON AND STEEL (Cont'd.)		
688	Kuboda Iron Works	More data required.	1a
691	Osaka Kozai Company	More data required.	2a
694	Gamamori Steel Works	More data required.	2b
695	Kaka Foundry Works	More data required.	2b
696	Sambei Metal Works	More data required.	1b
698	Iron Works	More data required.	2a
700	Nihon Steel Pipe	More data required.	3b
701	Kuboda Iron Works	More data required.	2b
702	Wakayama Iron Works	More data required.	2b
703	Mibara Iron Works	More data required.	2b
*713	Nakayama Steel Works	Important, blast furnace products.	3b
	MACHINES AND MACHINE TOOLS		
631	Kansei Electric Machinery Co.	More data required.	2a
648	Dai Nippon Crane Manufacturing Co.	More data required.	1a
661	Amatsuji Steel Ball Bearing Company	Rptd only Japan production bearing balls.	1a
687	Osaka Wakayama Iron Works	Machine tools, gauges, aeroplane engines & parts.	2a
1191	Hatsudori Seizo	Diesel engines, locomotive parts & machinery.	2b
	NAVAL BASES AND SHIPYARDS		
272	Osaka Iron Works Unit No. 1	Important; can build ships of 12,000-ton class.	3b
273	Fujinagata Shipyard	Light cruisers, destroyers, submarines.	3b
699	Osaka Iron Works Unit No. 2	Operates in conjunction #272.	3b
	NON-FERROUS METALS		
262	Sumitomo Electric Wire and Cable Works	Important.	2b
263	Sumitomo Copper and Steel Tubing Company	Very important; copper, aluminum products, etc.	3b

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March, 1943

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OSAKA (Continued)

Target No.	Target Name	Significance	Zone - Vulnerability
	NON-FERROUS METALS (Cont'd.)		
265	Tai Nippon Tungsten Company	More data required.	2a
689	Osaka Aluminum Company	More data required.	1a
690	Asano Copper Works	Important, bars & rods.	1a
692	Sumitomo Copper Works and Warehouse	More data required.	2b
693	Taido Aluminum Company	More data required.	2b
697	Mitsubishi Copper Refinery	Rptd one of four largest in Japan.	1a
1193	Toyosaki Copper Works	Important, sheets and plates.	1b
	PETROLEUM		
257	Maruzen Toyo Petroleum Refinery	Secondary, 1,000 barrels per day.	2b
258	Mitsubishi Oil Company	Important storage.	2c
259	Osaka Oil Refinery	More data required.	3b
260	Rising Sun Petroleum Tanks	More data required.	2c
261	Standard Vacuum Oil Co.	Minor storage.	3c
	TRANSPORTATION		
1206	Osaka City Railroad Station	Most important station in Osaka.	2a
1207	Shinyodo Railroad Bridge #1	Key bridge Tokaido Line entering Osaka.	3c
1208	Shinyodo Railroad Bridge #2	On Osaka-Kobe main line.	3c
	WATER SUPPLY		
1210	Osaka Water Works	Principal water works for Osaka.	3c
	MISCELLANEOUS		
1211	Osaka Central Market	Largest in Osaka.	2a

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Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March, 1943

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KOBE

Population - 967,234 (1940).

Location - NW head of Osaka Bay, Latitude 34° 40' N., Longitude 134° 10' E.

Importance - In peacetime, Kobe ranked as one of Japan's leading ports and shipbuilding centers (having built approximately 23% of all types of ships built in Japan in 1937-38). At present, it is also important as a producer of aircraft, steel and steel alloys, rubber tires, heavy ordnance, railway equipment, machinery and machine tools. Located near Kobe, and partially dependent on it for materials and some of their workers are aircraft, chemical and textile plants. In contrast to other large industrial cities, there are comparatively few small industries (match factories and food processing plants) scattered throughout the city.

Kobe is also an important railway center, being the terminus of the Tokaido Line (Tokyo-Kobe) and of the Sanyo Line (Kobe-Shimonoseki). There are five railroad stations and an important rolling stock factory in the city. Kobe is an important trans-shipment point for military and civil cargo.

Kobe is the capital of Hyogo Prefecture and the seat of its civil and military administration.

00062

General Description - The city occupies a long, narrow strip of land, flanked on the south by Osaka Bay and on the north by a range of high, wooded hills. The restricted area for development has made for considerable congestion with relatively few open spaces. The major fire breaks are the elevated Tokaido RR lines and three wide avenues which extend E-W along the entire length of the city. The major N-S breaks are located on either side of the central Kobe piers.

The commercial district is located in the center of the city, just NW of the central piers and south of the elevated railway lines. The principal government and other municipal buildings are located N and W of the commercial district, in an area extending up into the foothills to the north. The predominantly residential districts are located to the west and north of the commercial district. Another residential area, this one interspersed with factories and some commercial buildings, extends along the eastern side of the city. Better spaced residences, schools and public buildings extend along the foothills at the northern outskirts of the city.

Kobe is probably the most densely populated of Japan's large cities. According to the calculations made in this study, Zone I in Kobe has a population density of 104,000 persons per square mile, while Zone II has a density of 60,000. In other words, the average density of Zones I and II is about 76,000 persons per square mile.

Kobe, a city with no large rivers or canals, is dependent for water on 3 large reservoirs in the hills to the north. This water supply has never been plentiful and it is considered dangerously low for large-scale fire fighting, especially in the dry season.

Fire Areas - There are four fire areas in Kobe.

Zone I - Zone I covers the heart of Kobe city. It extends along both sides of the Tokaido Main Line and is bounded on the east by the Kobe Steel Works near the waterfront and a cemetery to the north and on the west by the Shinminato River. The center of this area is

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Kobe (Cont'd.)

occupied by the city's commercial district, conspicuous by its modern western buildings among which are interspersed densely-crowded dwellings. Just W and N of the commercial district are the government buildings, central post and telegraph offices and other public buildings. A solid mass of workers' homes extends W and N. This is the most densely populated part of Kobe city, with few fire breaks and very few fire-resistive structures. Among the most important industries located in the western part of Zone I are aircraft, ordnance, machinery, chemical and shipbuilding. The eastern part of Zone I is a mixed residential/commercial/industrial area. Located here are many native stores and food processing plants, with large clusters of flimsy wooden warehouses. Workers' homes extend throughout this part of the zone, particularly near the elevated railway line. Among the most important industries located here are rubber, steel and chemical. Small factories are scattered throughout this part of the zone. Two important steel plants are located on the waterfront, just outside this zone. According to insurance ratings the districts of highest fire hazard in Kobe are located in the eastern and western parts of Zone I.

Zone II - Zone II comprises three separate areas. The easternmost area covers a residential district. There are relatively few modern buildings in this area, and most of the structures, while not as closely crowded as in the center of the city, are nevertheless highly inflammable.

The southernmost part of Zone II covers the city's main port facilities. Many warehouses and wholesale establishments extend throughout this zone. Their construction varies from ferro-concrete to wood, and the buildings are well spaced. While it is unlikely that any serious conflagration could develop here, the combustible contents stored in most of these buildings render them highly suitable for incendiary attack.

The western section of Zone II extends from the conspicuous Mitsubishi Dockyard on the E to the western outskirts of the city. The southern part of this area is highly industrialized, the northern part predominantly residential. The principal industries located here are shipyards, aircraft, rolling stock, textile mills, chemical and precision instruments. Also located here are sugar refineries, a large oil storage and an important power plant.

It is important to note that the principal freight and passenger stations are all located in the most congested parts of the city. These stations as well as much of the elevated right-of-way are vulnerable to damage by conflagration.

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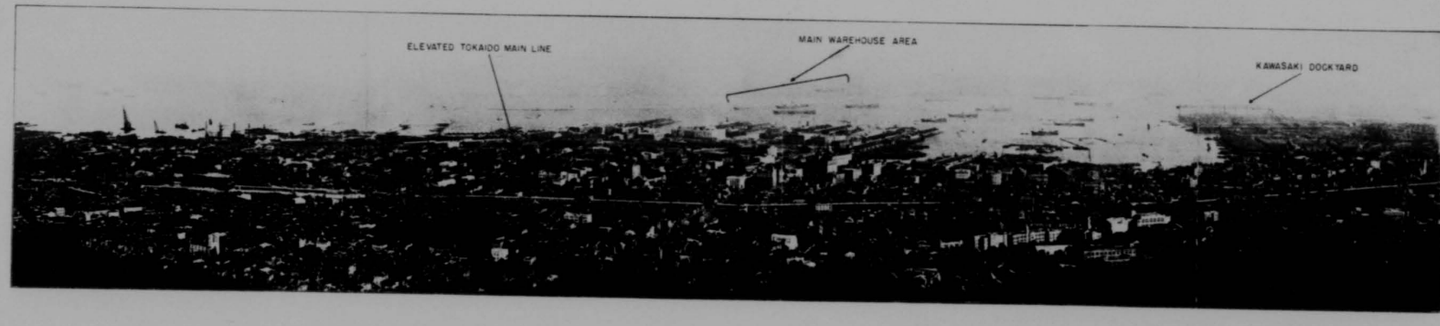
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KOBE



Panorama of Kobe City showing typical residential congestion which surrounds commercial district in center and factory district at right.

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KOBE



Looking east over Dunlop Rubber Plant (Target 14) in eastern part of Kobe. Note congestion of warehouses and workers homes.



Elevated Tokaido Main Line in center of Zone I area showing congestion of housing which borders the RR. Large buildings in upper right are government offices. Looking NW.

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KOBE



Eastern section of Kobe, covering Zone I at right and Zone II at left. Note that congestion of workers' homes crowds large industrial plants in center. Plants are Kobe Steel Works, Units 1 and 2 (Targets 5 and 6) and Dunlop Rubber Plant (Target 14).

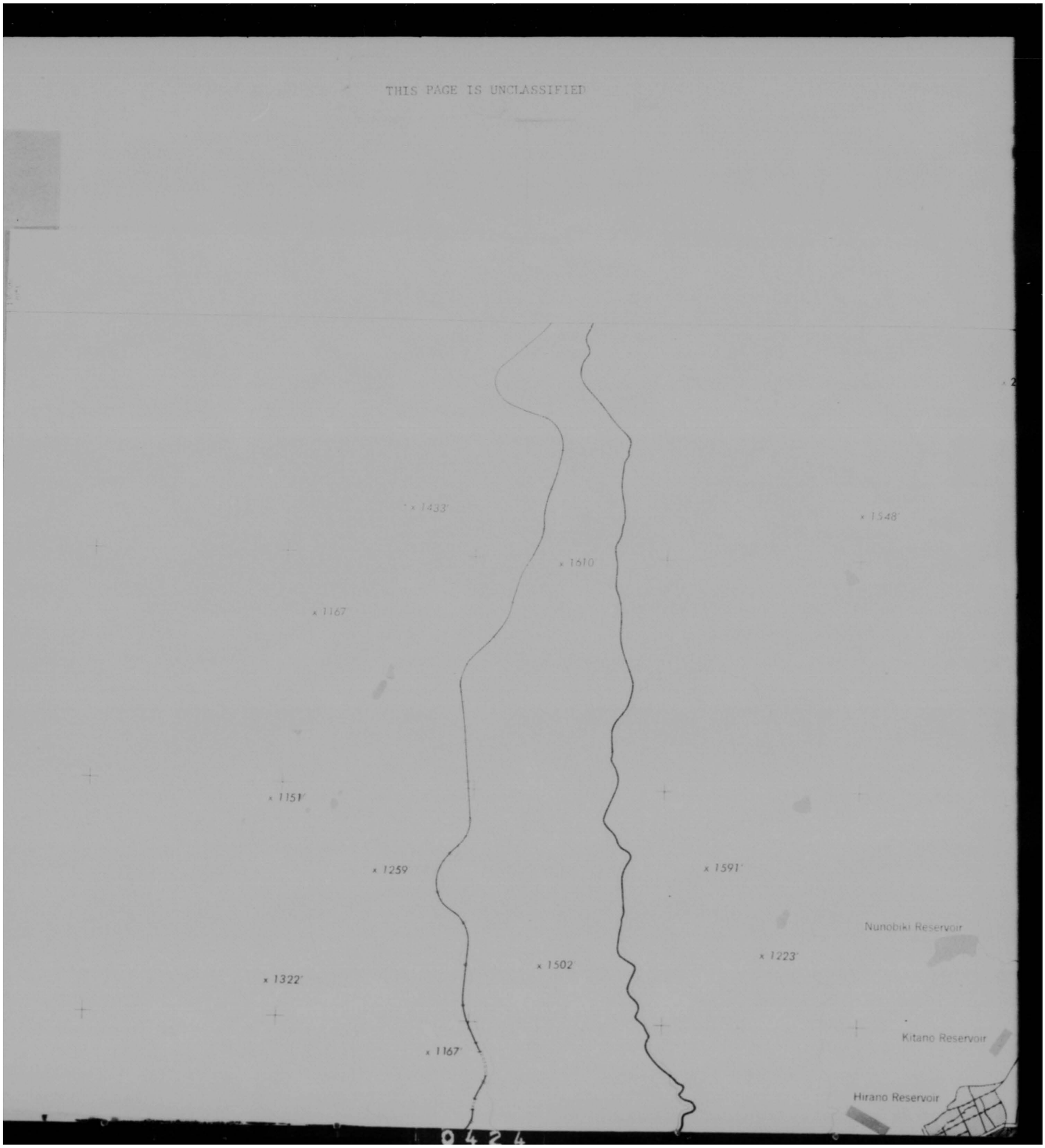


Main port area of Kobe (Target 22) showing storehouses and large warehouses. View shows typical unit fire areas cut out by wider streets and elevated Tokaido RR line. Zone I.

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x 1476

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x 1020'

x 1187'

x 593'



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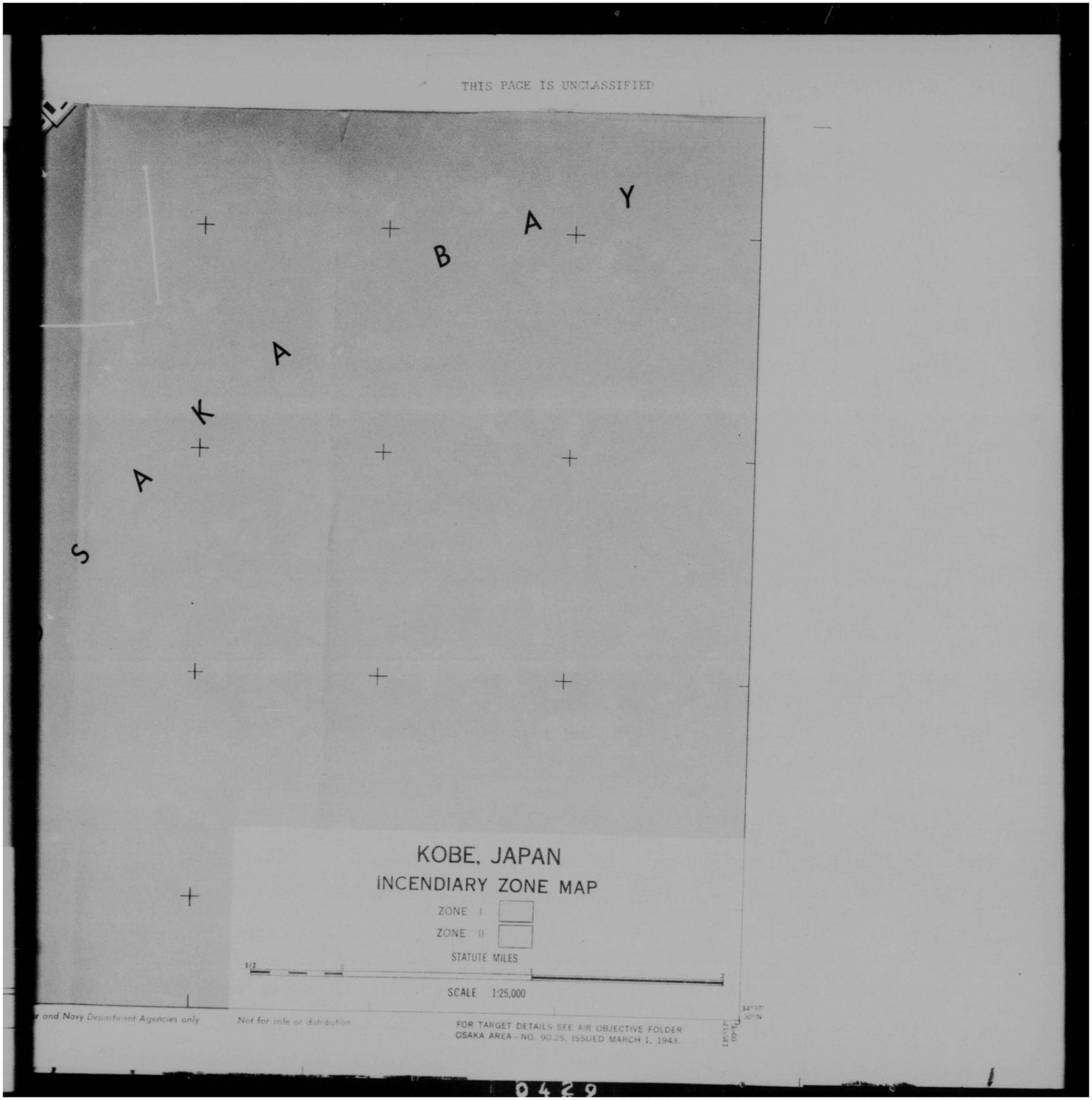
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SELECTED TARGETS IN KOBE CITY

Source: Air Obj. Folder, No. 90.25, Osaka Area, Issued March 1, 1943

Target No.	Target Name	Significance	Zone - Vulnerability
	AIRCRAFT		
*10	Kawasaki Aircraft Factory	One of largest plane, engine plants.	2b
*11	Kawasaki Dockyard Company, Ltd Aircraft Works	One of largest plane, engine plants.	2b
210	Kawasaki Dockyard Company, Aircraft Works (Point Kawa)	Rptd under construction, more data required.	2a
775	Yamamoto Airplane Implements	No details.	2b
	ARMS, MUNITIONS		
783	Army Ordnance Factory	No details.	1a
	CHEMICALS		
15	Kaneyama Chemical Works	More data required.	1a
785	Sakafuchi Soda and Magnesium Factory	More data required.	2a
787	Asahi Carbonic Acid Gas Works	More data required.	1a
1199	Taiwan Sugar Refinery	Important; sugar and alcohol	2b
1200	Meiji Sugar Refinery	Sugar & alcohol.	2b
	ELECTRIC POWER		
4	Minatogawa Steam Power Plant	Secondary - 38,000 Kw.	2c
	HARBOR FACILITIES AND WAREHOUSES		
22	Kobe Harbor District No. 1	Most important section of Kobe Harbor.	2a
34	Kobe Harbor District No. 2 (Hyogo Harbor)	Important for coast-wise shipping.	2a
	IRON AND STEEL		
*5	Kobe Steel Works Unit No. 1	Important, rptd 10% Japan output.	3b
6	Kobe Steel Works Unit No. 2	Operates in conjunction with #5.	1b
7	Kawasaki Dockyard Co Steel Works	Important, steel for Dockyard shipbuilding.	3b

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March, 1943

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KOBE (Cont'd.)

Target No.	Target Name	Significance	Zone - Vulnerability
	IRON AND STEEL (Cont'd.)		
8	Uyenoshita Steel Works No. 2	More data required.	1b
9	Uyenoshita Steel Works Unit No. 1	More data required.	2b
	MACHINES AND MACHINE TOOLS		
774	Imperial Precision Machinery Works	More data required.	2b
779	Precision Machinery Works	More data required.	2b
782	Kobe Machinery Works	More data required.	2b
784	Kobe Engine Factory	More data required.	1a
786	Electric Machinery Works	More data required.	1a
	NAVAL BASES AND SHIPYARDS		
169	Mitsubishi Dockyard	Important; building & repair, capital ships.	2b
171	Kawasaki Dockyard Company	Important; can build capital ships.	2b
	PETROLEUM		
17	Rising Sun Petroleum Co	Important storage terminal.	2c
	TRANSPORTATION		
154	Kobe Railroad Station	Central passenger station.	1a
156	Onohama Railroad Station	Important freight station.	2a
157	Sannomiya Railroad Station	Passenger station.	1a
158	Wadamisaki Railroad Station	Important freight station.	2a
159	Takatori Railroad Station	More data required.	2a
538	IGR Shops, Takatori	Very important repair & maintenance.	2b
	RUBBER		
*14	Dunlop Rubber Works No 1	Rptd over 30% tire mfg capacity of Empire.	1a
788	Asahi Rubber Works	More data required.	1a
1204	Hanshin Rubber Company	All kinds rubber products.	2a
1205	Yokohama Rubber Company	All kinds rubber products.	2a

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March, 1943

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NAGOYA

Population - 1,328,084 (1940).

Location - At the head of Ise Bay, Latitude 35° 09' N., Longitude 136° 55' E.

Importance - Nagoya ranks among the primary war production centers in Japan proper. It is one of the leading producers of aircraft, machine tools, automobile parts, railroad equipment (much of this capacity converted to tanks), high grade alloys, ordnance, textiles and ceramics. In addition, it is the site of hundreds of smaller factories producing bicycles, machinery, precision instruments, chemicals and pharmaceuticals, as well as food processing plants. In 1938 Japanese industrial directories listed 5,863 factories (employing five or more persons) in the city, many of which were small household establishments producing components for the larger plants. Moreover, Japan's largest automotive works and three or four aircraft assembly plants are located within 20 miles of the city and depend on it for parts and for some of their workers.

Nagoya is also one of Japan's vital railroad centers. Not only is it an important station on the Tokaido Main Line (Tokyo-Kobe), but it is also the terminus of the Kansai Line (Nagoya-Osaka) and of the Chuo Line (Nagoya-Tokyo). In 1936-37 Nagoya ranked first in Japan in the number of freight cars handled, third in gross volume of goods handled, and fourth in gross number of passengers. There are nine railroad stations in the city. In addition to the Imperial Government Railways, there are four privately-operated electric passenger railways which connect Nagoya with many of the surrounding towns and have their terminals in the city.

Nagoya is the capital of Aichi Prefecture and the seat of its civil and military administration. Its port ranked among Japan's five busiest in peacetime.

General Description - Nagoya city is distinctly outlined by the harbor to the south, the Shonai River along the western and northern sides, and by low hills to the east. The city is low-lying with comparatively few buildings exceeding three stories in height.

Three main canals provide waterbreaks through the central urban area, but they are narrow and their banks are lined with inflammable lumber storages, warehouses, landing stages and dwellings. There are several wide avenues, running generally N-S and E-W, as well as the "Y"-shaped railroad right-of-way which may provide effective fire breaks.

The city's rapid growth in the past 15 years has resulted in a minimum of city planning and a mushroom growth of shops and workers' homes. The central portion of the city is especially crowded, with comparatively few wide streets. Wider streets and better spaced residences prevail along the eastern and southeastern parts of the city. The great majority of homes in the city are built in the traditional Japanese style and are highly inflammable. Many of the newer factories are of fire-resistive construction, asbestos or metal sheeting over steel frames or reinforced concrete. The older plants, however, rate high in fire hazard, although some of them (notably the large textile plants) are equipped with sprinkler systems. There is a high correlation of older industrial plants and dense workers' quarters, seriously exposing these factories to damage by conflagration. The newer factories are located along the NW, NE and southern extremities of the city. While several of these factories are surrounded by the homes of their employees, they are generally not as much exposed to damage by conflagration as are the older plants. The city's vulnerability to incendiary attack may best be

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Nagoya (Cont'd.)

shown by the following official statistics released in 1938:

Number of wooden buildings	-	315,402
Others	-	10,638
Number of concrete buildings	-	361
Number of brick buildings	-	301

Fire Areas - Four fire areas are indicated.

Zone I - Zone I comprises the heart of Nagoya city. In the center of this area is the city's commercial district, including many company offices, banks, wholesale establishments, textile company showrooms and department stores. To the south and east of these business buildings are hotels, theaters, the main post and telegraph offices and numerous factories of moderate size. Factories and warehouses dot the southern part of this zone especially along the banks of the canals.

According to fire insurance ratings the part of Zone I immediately south of the Nagoya Castle Grounds contains the only "first class" (fire resistive) construction in the city. Even here, however, the fire-resistive buildings, which front on wide streets, adjoin dense clusters of workers' homes and small household shops - all known to be inflammable. There are about 6 wide streets in this zone which may constitute effective fire breaks, at least in the absence of wind. Two canals constitute other breaks, the effect of which is questionable in view of the highly inflammable structures on their banks.

Zone II - Zone II comprises three districts. One of these districts extends along the eastern side of the city. The southern half of this district covers important aircraft factories, alloyed steel plants, arsenals, a synthetic petroleum plant and hundreds of smaller factories. Workers' homes crowd these factories on all sides. More open residential areas extend eastward. The northern half of this district covers two aircraft engine factories, four large machine tool plants, several textile plants and many smaller factories interspersed among workers' homes. The western part of this district (next to the Castle Grounds) contains the prefectural and local government offices. The northern part (north of the Castle Grounds) includes several textile and machine tool plants, closely surrounded by some of the city's poorest and most inflammable dwellings.

A second district of Zone II covers the warehouse area of the port of Nagoya. Warehouse construction here varies from reinforced concrete to sheet metal or asbestos slate over steel frames. The warehouses located along the short connecting canal north of the piers are small, flimsy structures.

The third portion of Zone II covers the Nagoya Station, and includes the city's main freight yard (site of very large warehouses) railroad shops, textile factories, automobile parts and ceramics plants, and many smaller factories. Interspersed among these are workers' dwellings, most of which are inhabited by railroad employees and their families.

As indicated on the Nagoya Zone Map, the IGR railroad lines lead along the boundaries of these fire areas. These lines, together with the electric lines which pass through the fire areas, are vulnerable to conflagrations in the adjoining fire areas.

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NAGOYA



Looking NW across Nagoya Castle into crowded workers homes district in Zone II fire area.



Looking west across the central portion of Zone I, a district of residences, schools, hotels, and large stores.

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NAGOYA



Detail of the central factory zone in Zone II. The Toho Gas Works' synthetic petroleum plant (Target 456) is visible at the left, while parts of the Atsuta Arsenal (Target 197) appear at the right.



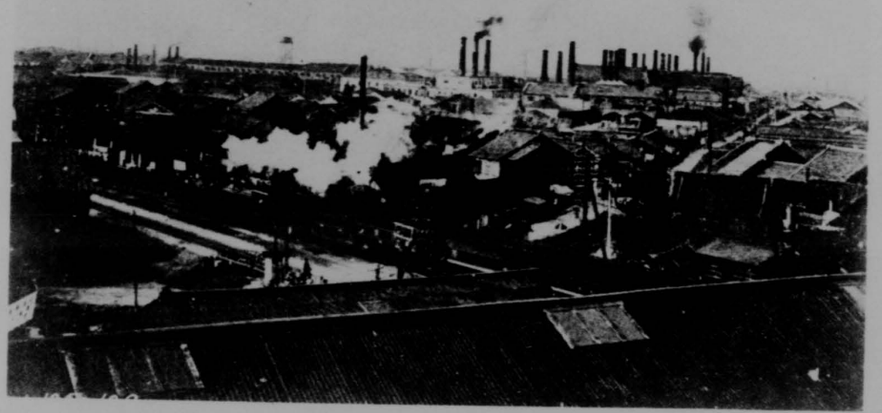
Looking east across the southern portion of Zone II. Plant in foreground is Aichi Aircraft Works (Target 198).

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NAGOYA



The northwestern factory district showing congestion of residences which crowd the plants in zone II. Plant at upper left is Toyoda Machinery Co. (Target 430); at upper right is Japan Porcelain Co. (Target 1153).



Looking south across the Nagoya Station & Freight Yard (Targets 250a & c). Note congestion of workers homes on either side of RR Zone II.

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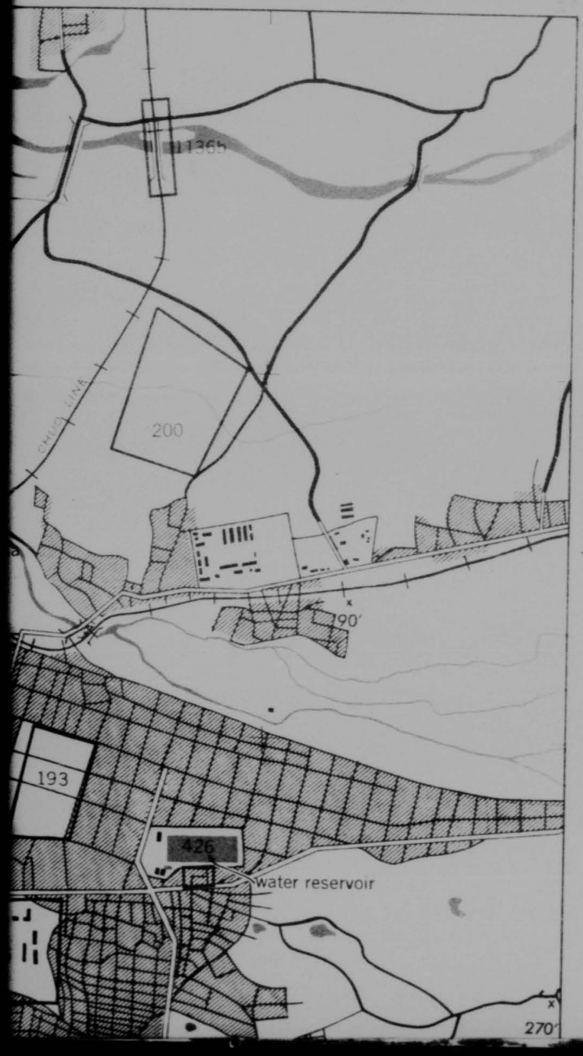
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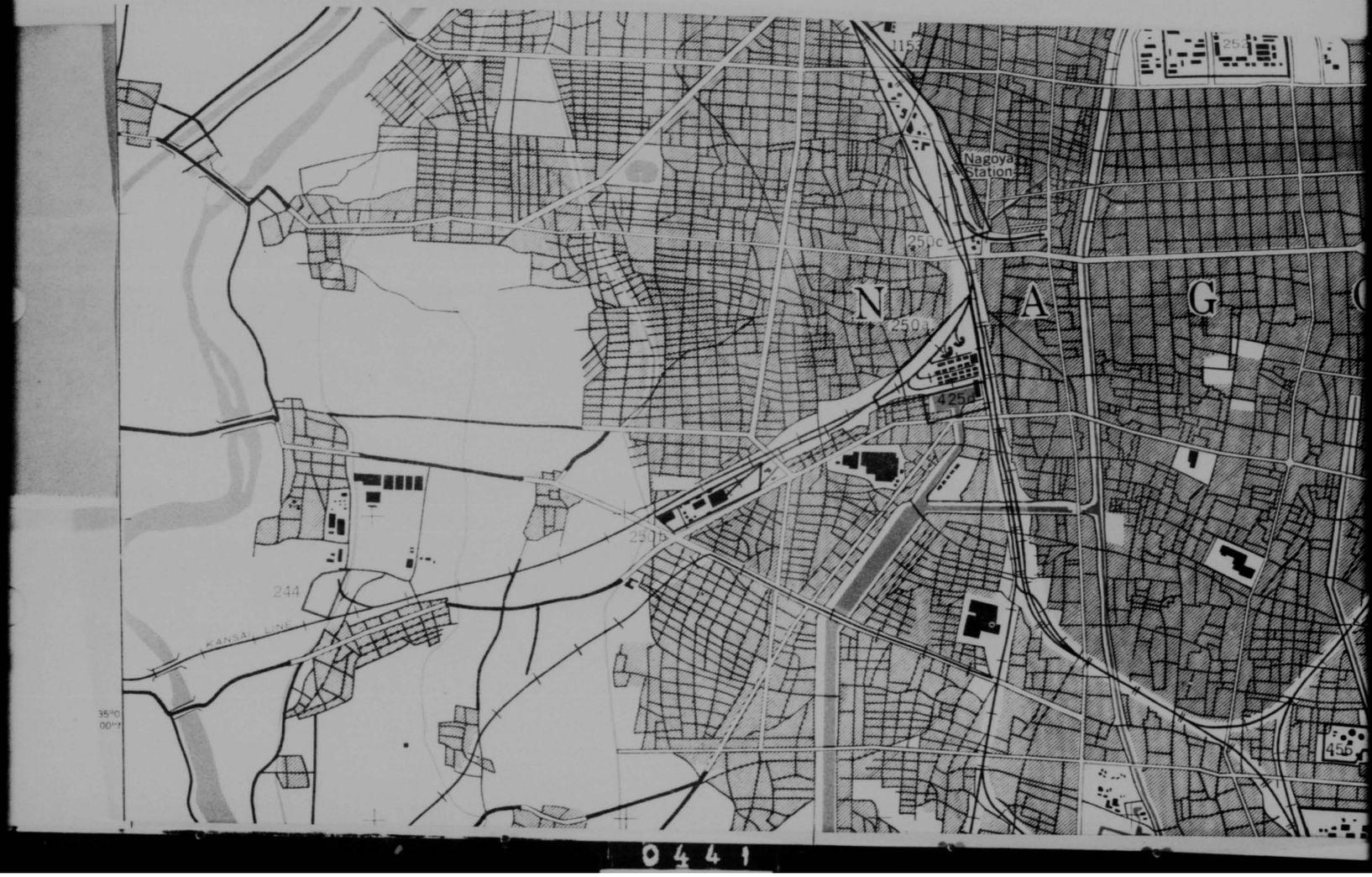
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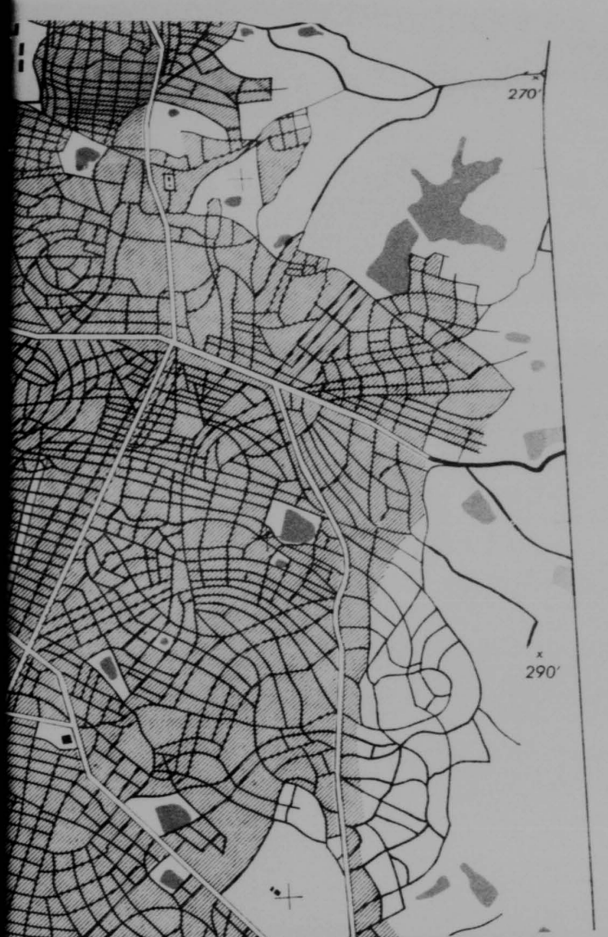
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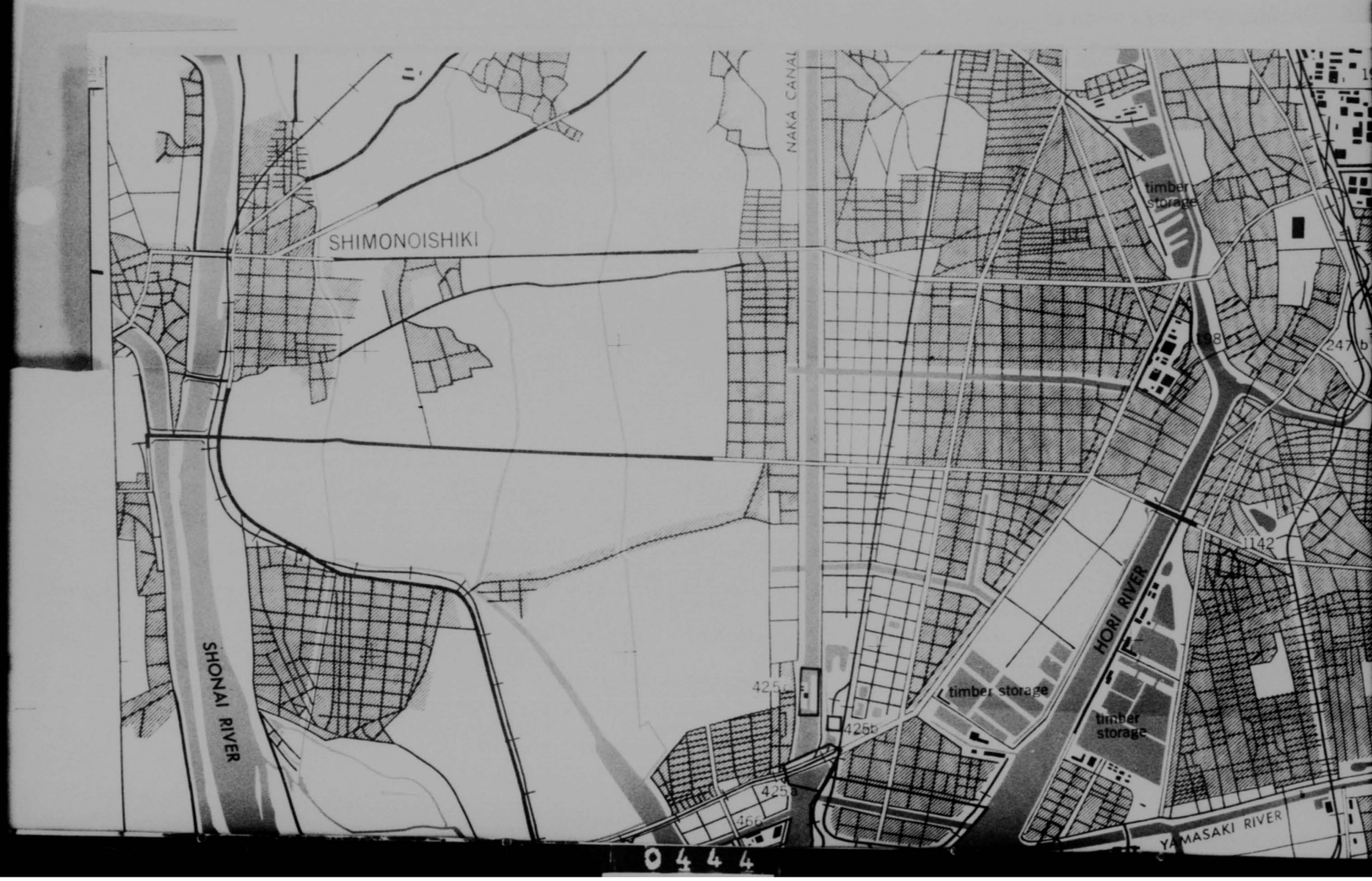


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SEPTEMBER 1943

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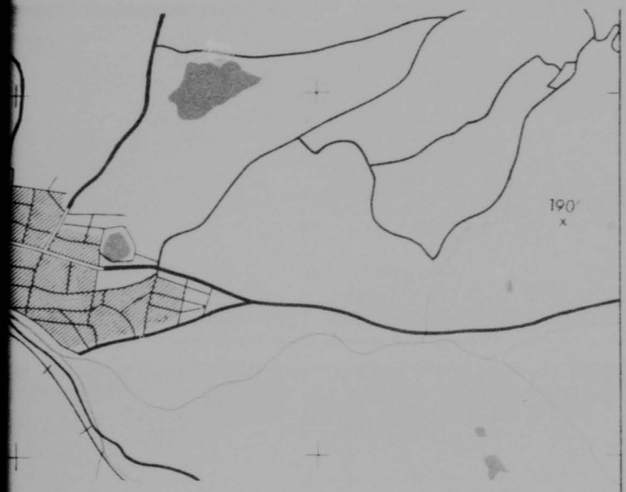
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FOR TARGET DETAILS SEE AIR OBJECTIVE FOLDER
NAGOYA AREA- NO. 90.20, ISSUED DEC. 1, 1942.

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SELECTED TARGETS IN NAGOYA CITY

Source: Air Obj. Folder, No. 90.20, Nagoya Area, Issued Dec. 1, 1942

Target No.	Target Name	Significance	Zone - Vulnerability
	AIRCRAFT		
*193	Mitsubishi Aircraft Engine Works	One of most important engine plants.	2b
*194	Mitsubishi Aircraft Works	Important research; also planes, engines.	3b
196	Chigusa Factory of Nagoya Arsenal	Engines, instruments, ordnance.	2b
197	Atsuta Factory of Nagoya Arsenal	Ordnance, also aircraft components.	2a
199	Mizuho Branch of Aichi Aircraft Works	Parts, possibly engines.	2a
198	Aichi Aircraft Works	Planes, engines, instruments.	2a
242	Okamoto Industrial Company	Parts.	2b
1129	Kasadera Branch of Okamoto Industrial Co	Parts.	3b
	AIRPORTS		
248	Nagoya Civil Airport	Minor.	3c
	ARMS, MUNITIONS		
241	Nihon Vehicle Company	Important tank & munitions production.	2a
200	Toriimatsu Factory of Nagoya Arsenal	New, large, important ordnance production.	3b
	AUTOMOBILES, MOTORS		
430	Toyoda Machinery Manufacturing Co	Secondary production automotive parts.	1a
1141	Shinkawa Plant of Toyoda Automobile Company	Secondary production automotive parts.	3b
	BUILDING MATERIALS		
454	Tokokuni Cement Company	Large plant.	3b
455	Onoda Cement Company	Large plant.	2b
	CHEMICALS		
253	Japan Artificial Fertilizer Company	Nitric acid, possibly direct munitions.	3b

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March 1943

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NAGOYA (Continued)

Target No.	Target Name	Significance	Zone - Vulnerability
	CHEMICALS (Cont'd.)		
255 -	Yahagi Electro-Chemical Plant	Nitric acid, rptd light-metal alloys.	3b
466	Tokai Soda Company	Secondary, caustic soda, etc.	3b
467	Showa Soda Company	Caustic soda, liquid chlorine, etc.	3b
	DEFENSES		
252	Third Division Military H.Q.	Minor.	3c
	ELECTRIC POWER		
195	Nagoya Steam Power Plant	Main source of steam power for Nagoya - 109,000 Kw.	3c
1142	Atsuta Steam Power Plant	Standby, 10,000 Kw.	2c
	HARBOR FACILITIES AND WAREHOUSES		
251	Nagoya Harbor	Important; 4th largest peace-time port.	2a
	IRON AND STEEL		
247 a,b,c	Daido Electric Steel Company	Munitions, tools, aircraft parts; 3 units.	3b
	MACHINES AND MACHINE TOOLS		
254	Mitsubishi Electric Manufacturing Co	Important, tools, aircraft parts.	2b
461	Ozone Plant of Okuma Iron Works	Tools & munitions.	2a
1146	Hagino Plant of Okuma Iron Works	Important tools & munitions production.	2b
1147	Nunoike Plant of Okuma Iron Works	Tools & munitions.	1a
1148	Takaoka Engineering Works	Minor; aircraft & automotive parts.	1a
1149	Yamada Engineering Works	Minor; tools, hydraulic pumps.	2a
	PETROLEUM		
243	Rising Sun Oil Storage	Minor fueling depot for harbor shipping.	3c

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March 1943

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NAGOYA (Continued)

Target No.	Target Name	Significance	Zone - Vulnerability
	PETROLEUM (Cont'd.)		
244	Hatta Oil Storage	Small.	3c
456	Toho Gas Works' Synthetic Oil Plant	Synthetic oil, large gas works.	2b
	TRANSPORTATION		
250-a	Nagoya Freight Yard	Important; largest yards Nagoya area.	2a
250-b	Nagoya Repair Shops	Important; largest shops Nagoya area.	2a
250-c	Nagoya Station	Secondary.	2a
425	Nada Canal (See A to d below)	Intensive artery between port & freight yards.	3c
425-a	Nada Canal Tramway Bridge	See #425	3c
425-b	Nada Canal Control House	See #425	3c
425-c	Nada Canal Elevated Crane	See #425	3c
425-d	Nada Canal Barge Basin	See #425	3c
1132 a & b	NW Shonai River Bridges	On main line.	3c
1136 a & b	NE Shonai River Bridges	On alternate route to Tokyo.	3c
	WATER SUPPLY		
426	Nagoya Filtering Plant	Filter plant Nagoya water supply.	3c
	MISCELLANEOUS		
1153	Japan Porcelain Company	Major industrial porcelain & fire-brick plant.	1b
1171	Nippon Insulator Company	Minor industrial ceramics, spark plugs, etc.	2b

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March 1943

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HIROSHIMA

Population - 343,968 (1940).

Location - At the head of Hiroshima Bay at Latitude 34° 23' N., Longitude 132° 27' E.

Importance - Hiroshima has long been the headquarters of the Western army and is reported to be a main port of embarkation for the Southwestern Pacific theater. Huge supply depots are located here, including food, clothing and ordnance. At the SE end of the city is the military port of Ujina, an army transport base. Many large storehouses and barracks are located here. The Hiroshima Railroad Station, on the Sanyo Main Line (trunk line connecting Shimonoseki and Kobe) is an important military supply transport center and the site of many warehouses. Aside from the ordnance maintenance shops, there is virtually no industry in Hiroshima.

General Description - Built on a delta, Hiroshima is cut-up by six river tributaries (which constitute effective fire breaks) and by several canals. These constitute virtually the only open spaces in the city. Old one and two story wooden residences extend in a solid mass over the four islands which constitute the heart of the city. A few large, fire-resistive public buildings are located in the east-central portion of the city, along two wide streets which run southward from the Castle Grounds. These municipal buildings are surrounded by highly inflammable wooden structures. Large military zones, covered with barracks and warehouse buildings are located in the northern (on the Castle Grounds) and southeastern portions of the city, where the residential structures begin to thin out. Most of these military buildings are of brick with slate or tile roofs. Most of the warehouses are of fire-resistive construction, but some are reported to be of predominantly wooden construction. The port of Ujina is also the site of many warehouses.

0071

Fire Areas - As shown on the accompanying map, four fire areas have been indicated for Hiroshima.

Zone I - Zone I comprises the heart of Hiroshima city, and covers the oldest and most congested part of the city. Three rivers constitute the only effective fire breaks. The streets are extremely narrow with the exception of two wide avenues. The only large, non-residential buildings in this zone (government and business offices) are located along these two wide streets which run southward from the Castle Grounds.

Zone II - Zone II comprises three separate fire areas. The western area covers a residential district which is slightly less congested than the center of the city. Even here, however, there are dense clusters of wooden and adobe homes, the only larger and more fire-resistive structures being a few schools.

The northern zone covers the principal military district of Hiroshima. Located here are divisional headquarters (site of many brick and wooden barracks) ordnance stores, maintenance shops and supply warehouses. The eastern tip of the area covers the Hiroshima Railroad Station and Freight Yard, site of many warehouses and railroad workshops.

The southeastern part of Zone II covers another military zone. Located here is a large ordnance depot (for munitions and chemicals), an army clothing depot, and the city's gas works. To the south are the Ujina port installations. This area is congested with army warehouses, and is also the site of an army food depot. Some of these warehouses are known to be reinforced concrete, fireprcof structures. Others are less substantial, brick or sheet metal over wooden frames. It is presumed that the area is congested with stores and inflammable temporary structures.

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HIROSHIMA



Looking NW across Hiroshima. Note that congestion extends all the way to the hills in upper left.



Looking north through center of Hiroshima. Note that there are relatively few substantial buildings and that the rivers and a few parks constitute the only major fire breaks. Military H. Q. and barracks (Targets 748, 739, 750) are located at upper right. Prison in foreground.

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HIROSHIMA, JAPAN

INCENDIARY ZONE MAP

ZONE I

ZONE II

STATUTE MILES

SCALE 1:25,000

SEPTEMBER 1943

COMPILED FOR THE U. S. ARMY A.A.F. BY THE U.S. COAST AND GEODETIC SURVEY, WASHINGTON, D. C.

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FOR TARGET DETAILS SEE AIR OBJECTIVE FOLDER
KURE AREA NO. 90-30, ISSUED OCT. 15, 1942.

14°20'
00°N

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SELECTED TARGETS IN HIROSHIMA CITY

Source: Air Obj. Folder, No. 90.30, Kure Area, Issued Oct. 15, 1942

Target No.	Target Name	Significance	Zone - Vulnerability
	AIRPORTS		
795	Hiroshima Airfield	Civil landing field.	3c
	ELECTRIC POWER		
742	Electric Railways Power Station	Steam in Hiroshima City.	3c
743	Electric Power Generator	In Hiroshima city, no details.	3c
744	Electric Generator	In Hiroshima city, no details.	1c
	HARBOR FACILITIES AND WAREHOUSES		
735	Army Transport Base	Ujina Port, principal military harbor.	2c
	ARMS, MUNITIONS		
736	Army Ordnance Depot	Large army depot for Hiroshima-Ujina port.	2a
737	Army Food Depot	Large army depot for Hiroshima-Ujina port.	2a
738	Army Clothing	Large army depot for Hiroshima-Ujina port.	2a
739	Army Division Ordnance Stores	Large army depot for Hiroshima-Ujina port.	2a
750	Moto-Cho Warehouse	Large army depot for Hiroshima-Ujina port.	2a
	TRANSPORTATION		
740	East Hiroshima Station	Jc main line & Ujina military branch.	2a
	MISCELLANEOUS		
741	Gas Works	Gas for Hiroshima City.	3c
745	Weather Observation Station	For Hiroshima area.	1c
746	Telephone Station	Central Hiroshima exchange.	1c
748	Division Headquarters	Army barracks, minor depots.	2c

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March, 1943

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YAWATA-TOBATA-WAKAMATSU

Population :

Yawata	261,309	(1940), (includes population of Kurosaki).
Wakamatsu	88,901	(1940).
Tobata	84,260	(1940).
Total	434,470	

Location - At the southwestern entrance to the Shimonoseki Strait, Latitude 33° 52' N., Longitude 130° 49' E.

Importance - Yawata is the site of the Imperial Iron and Steel Works, the largest steel plant in the Japanese Empire. This plant produces approximately 25% of Japan's pig iron and finished steel. Also located in the city are several chemical plants, coking plants and machinery works.

Wakamatsu, Japan's busiest commodity port, is especially important as an exporter of coal and an importer of iron ore, bauxite, coking coal, salt, etc. It is also an important industrial city, being the site of a large steel rolling mill, a synthetic oil plant, foundries, vegetable oil plants and a small shipyard.

Tobata is an industrial suburb of Yawata. It is the site of a large steel mill, a large shell and munitions plant, several large chemical and coking plants. It is also an important coal exporting port.

00073

Kurosaki, a suburb of Yawata, is a new and increasingly important war production center, the site of Japan's second largest alumina plant, Japan's second largest nitrogen fixation plant, electric machinery works and several small steel fabricating plants.

Yawata and its satellite cities lie astride Japan's most heavily burdened railway freight system. Railroads serving these cities are taxed to capacity to carry a vast tonnage of coal from the coal fields in the south to the export port, and to carry the heavy tonnages of freight from the Port of Moji to the rest of Kyushu Island.

In many respects the industries located in these cities constitute the heart of Japan's war industry, comparable to those in Germany's Ruhr.

General Description :

YAWATA - Yawata City is easily identified by the maze of blast furnaces, coke ovens, ore and coal dumps which constitute the Imperial Iron and Steel Works. The north side of the plant site is distinctly marked by the inlet which forms the port of Yawata. A belt of railway lines extend along the south and east sides of the plant. The city proper is located between these railway lines and a chain of low hills which roughly parallel the railways, giving the city an "L"-shape. Although cut up by numerous wide streets and hilly park districts, the city is very congested and there are large areas completely covered with low, wooden dwellings. There is virtually no industry in this part of the city and no central business district comparable to that found in other cities of the same size. The only buildings above two or three stories are the company hospitals and schools and the municipal buildings. Most conspicuous landmark to the south of the city is the elevated Otani Reservoir.

TOBATA - Tobata, located directly N by E of Yawata, is a congested industrial city, distinctly outlined by low hills to the south and a river to the east. The blast furnaces of the Tobata plant of the Imperial Iron and Steel Works, located along the waterfront to the north of the city, are conspicuous landmarks. The city is dingy and low-lying, and congested with flimsy workers' homes. Adjoining the steel works on the E side are workers' dormitories housing an estimated 8,000 persons. Virtually all the public buildings and larger stores are located between the steel plant and the conspicuous railroad freight yard to the south.

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Yawata (Cont'd.)

An industrial belt extends along the waterfront toward Yawata. An immense coaling yard extends along the waterfront alongside the railroad yard.

WAKAMATSU - Wakamatsu is located on the small point of level land, just NW of Yawata, to the west of which lie 1000-foot hills. The city proper occupies a very small and densely built-up area. Several small settlements are situated in the valleys to the west of the city proper. An industrial district is located along the northern half of the waterfront. The southern half of the waterfront is covered with a maze of railway tracks, coal piles and mechanical coal loaders. Virtually all public buildings are situated in the east-central part of the city.

KUROSAKI - Kurosaki, situated along the railroad line which leads west out of Yawata, is a modern industrial suburb of Yawata. It occupies a small area centered around its railroad station and the streets are laid in a radial pattern around this station. Little is known concerning the appearance of this town, but it is believed to be sufficiently congested to warrant incendiary attack. All the large industrial plants are situated on reclaimed land to the north of the railroad lines.

Fire Areas :

YAWATA - As indicated on the accompanying map, Yawata is divided into two fire areas.

0074

Zone I - Zone I comprises the entire southern part of the city, and extends in a general E-W direction. With the exception of three elevated parks, this zone includes a virtually unbroken stretch of workers' homes. Most of the estimated 20,000 employees of the Imperial Iron and Steel Works live in this zone, many of them in densely clustered wooden and brick dormitories. Just north and NE of the Otani Reservoir are located the city's public buildings, namely the company hospital, city offices, post office and police headquarters. The only other conspicuous buildings in this area (most of brick or concrete construction) are a few schools and stores.

Zone II - Zone II includes the eastern part of the city, a district entirely covered by workers' homes and dormitories. A chemical works and several units of the Imperial Iron and Steel Works (notably the plant's administration building) extend along the western part of this zone, near the railway tracks. Although cut up by several wide streets, most of this region rates high in fire hazard because of the dense clusters of wooden dormitories and homes.

TOBATA - Tobata has two fire areas

Zone I - Zone I covers the most densely populated part of the city, including the commercial district along the western part. This zone is distinctly outlined by low hills to the south, a river to the east, the railroad yard to the west and a steel plant to the north. The southernmost part of the steel plant (a congested area of shops and warehouses) is included in this zone. Also included are the workers' dormitories to the east of the steel works. There are several open spaces along the southeastern part of this zone, but the central portion has very few effective fire breaks.

Zone II - Zone II extends along the waterfront to the west of the city. This is primarily an industrial and warehouse district, and includes such objectives as large coking plants, a chemical plant, a munitions plant, a large textile mill and the city's freight yard and coaling wharves.

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Yawata (Cont'd.)

WAKAMATSU - There is one fire area, a Zone II area.

Zone II - Zone II stretches along the waterfront, extending inland to cover the most congested residential area. The northernmost portion, an industrial district, covers steel rolling mills, a shipyard and several small factories. Just south of this district, also along the waterfront, is Wakamatsu's commercial district. The southern part of this zone extends to Wakamatsu's coaling wharves, with their huge coal piles and mechanical coal loaders. Numerous combustible warehouses are located along the railroad line.

KUROSAKI - Only one fire area is indicated in Kurosaki, a Zone II area which covers the most densely built-up sections.

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YAWATA



View of Yawata City and Imperial Iron & Steel Works. Note rows of workers dormitories to left of reservoir in foreground. Upper part of view has been retouched in order to obliterate port and city of Wakamatsu.



Eastern part of Yawata city showing dense residential district to south and east of steel works.

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YAWATA



Detail of congested workers homes to the south of the Imperial Iron & Steel Works.



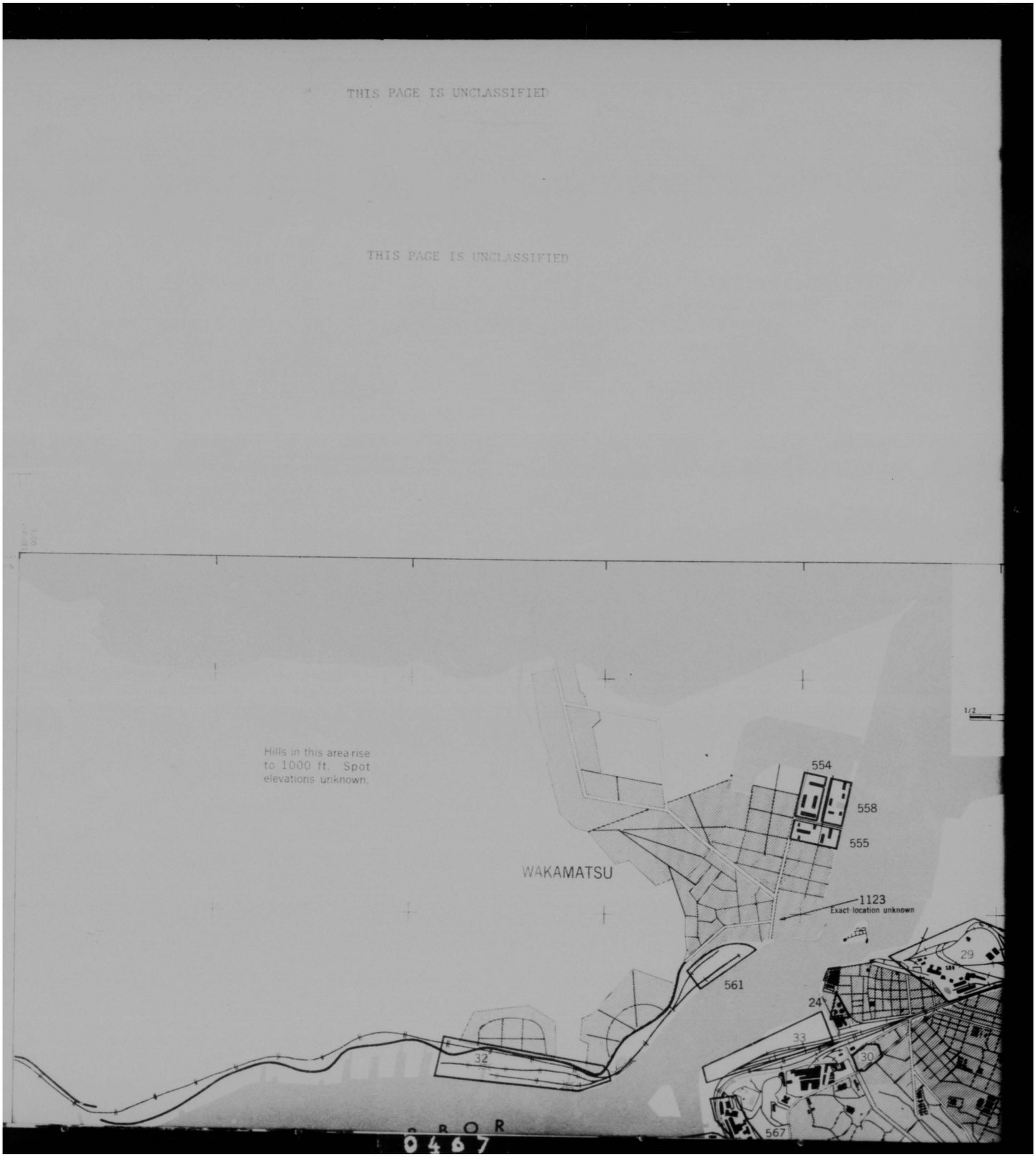
Sketch of Imperial Iron & Steel Works (Target 28) showing street pattern to south of plant.

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YAWATA, JAPAN

INCENDIARY ZONE MAP

ZONE I

ZONE II

STATUTE MILES

1/2 1 2

SCALE 1:25,000



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SEPTEMBER 1943

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FOR TARGET DETAILS SEE AIR OBJECTIVE FOLDER
SHIMONOSEKI AREA—NO. 90.34, ISSUED JAN. 1, 1943.

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SELECTED TARGETS IN YAWATA - KUROSAKI

Source: Air Obj. Folder, No. 90.34, Shimonoseki Area, Issued Jan. 1, 1943

Target No.	Target Name	Significance	Zone - Vulnerability
	CHEMICALS		
569	Kyushu Chemical Works, Yawata Plant	No details.	2b
*1113	Nihon Fertilizer Co, Kurosaki Plant	Important; fertilizer & war chemicals.	3b
	HARBOR FACILITIES AND WAREHOUSES		
31	Port of Yawata	Important.	3c
	IRON AND STEEL		
*28	Imperial Iron & Steel Works, Yawata Plant	Rated largest steel works Empire.	3b
556	Mitsubishi Steel Mfg Co	No details.	3b
557	Nihon Steel Works	No details.	3b
	MACHINES AND MACHINE TOOLS		
1126	Yasugawa Electric Machine Works	Large plant, electric equipment.	3b
	NON-FERROUS METALS		
*1108	Japan Aluminum Company	Very important alumina plant, rptd nearly 20% Empire capacity.	3b

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March 1943

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SELECTED TARGETS IN TOBATA CITY

Source: Air Obj. Folder, No. 90.34, Shimonoseki Area, Issued Jan. 1, 1943

Target No.	Target Name	Significance	Zone - Vulnerability
	CHEMICALS		
567	Asahi Glass Company	Very large glass and soda plant.	3b
	HARBOR FACILITIES AND WAREHOUSES		
33	Port of Tobata	Secondary.	2c
	IRON AND STEEL		
24	Minsukasa Coke Plant	Supplies #28, #29.	2c
29	Imperial Iron & Steel Works, Tobata Plant	Important steel and tinplate plant.	3b
30	Tobata Foundry Company	Important, munitions.	2b

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March 1943

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SELECTED TARGETS IN WAKAMATSU CITY

Source: Air Obj. Folder, No. 90.34, Shimonoseki Area, Issued Jan. 1, 1943

Target No.	Target Name	Significance	Zone - Vulnerability
	HARBOR FACILITIES AND WAREHOUSES		
32	Port of Wakamatsu	Very important coal & ore port.	2c
	IRON AND STEEL		
554	Kokusan Kogyo (Imperial Fdry)	Secondary.	2b
555	Tokai Kogyo (Tokai Steel Works)	Secondary bars & plate production.	2b
	PETROLEUM		
1123	Nissan Liquid Fuel Company	Secondary synthetic petroleum plant.	3b
	NAVAL BASES AND SHIPYARDS		
558	Tochigi Shipbuilding Yards	Rptd secondary but expanding.	2b
	TRANSPORTATION		
561	Wakamatsu Railroad Shops	Rptd important repairs.	2b

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Key Targets are Underlined. •Priority Targets. See Japanese Target Data, Issued March 1943

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FUKUOKA

Population - 323,217 (1940).

Location - Northwestern part of Kyushu Island at Latitude 33° 36' N., Longitude 130° 24' E.

Importance - Formerly known for its weaving and ceramics, Fukuoka is now important as the site of several munitions and machinery factories and a large rubber plant. It is also an army embarkation and a coal exporting port. Located near the city, and giving employment to many of its workers, are coal mines, an aircraft parts plant, a naval machinery plant and an automobile motor factory. Large military airfields and army camps are located nearby. Fukuoka is the capital of Fukuoka Prefecture and the center of its political and military administration.

General Description - The city occupies a long, narrow area along the southeastern shore of Hakata Bay. It is densely built-up and low-lying. Virtually all of the buildings over 3-4 stories are located along one main street which runs E-W along the center of town. Most conspicuous among the open spaces in the city are the military barracks and public schools near Obori Park on the western side and the campus of Kyushu Imperial University on the eastern side. Three large rivers flow into the bay through the city proper.

Fire Areas - There are three distinct fire areas in Fukuoka. Zone I covers the center of the city. Two areas, situated E and W of Zone I respectively, comprise Zone II.

00079

Zone I - Zone I is the site of Fukuoka's official buildings. Located here are prefectural and city offices, prefectural courts as well as many commercial and industrial offices. One and two story residences crowd these large structures, extending in a solid mass throughout the zone.

Zone II - The western part of Zone II is predominantly a coal miners' residence area, densely built-up and highly inflammable.

The eastern part of Zone II covers the city's chief mercantile district and the warehouse area along the waterfront, as well as a factory zone to the south. Densely grouped workers' residences surround the more substantial structures throughout this area. The southern part is industrial, being the site of textile mills, chemical plants, electrical equipment factories, machinery plants and a large foundry. The Hakata RR station and yards is located in the southern part of this area.

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FUKUOKA



Looking north across the center of Fukuoka, Zone I fire area. Note absence of effective fire breaks on either side of main artery in center of view.

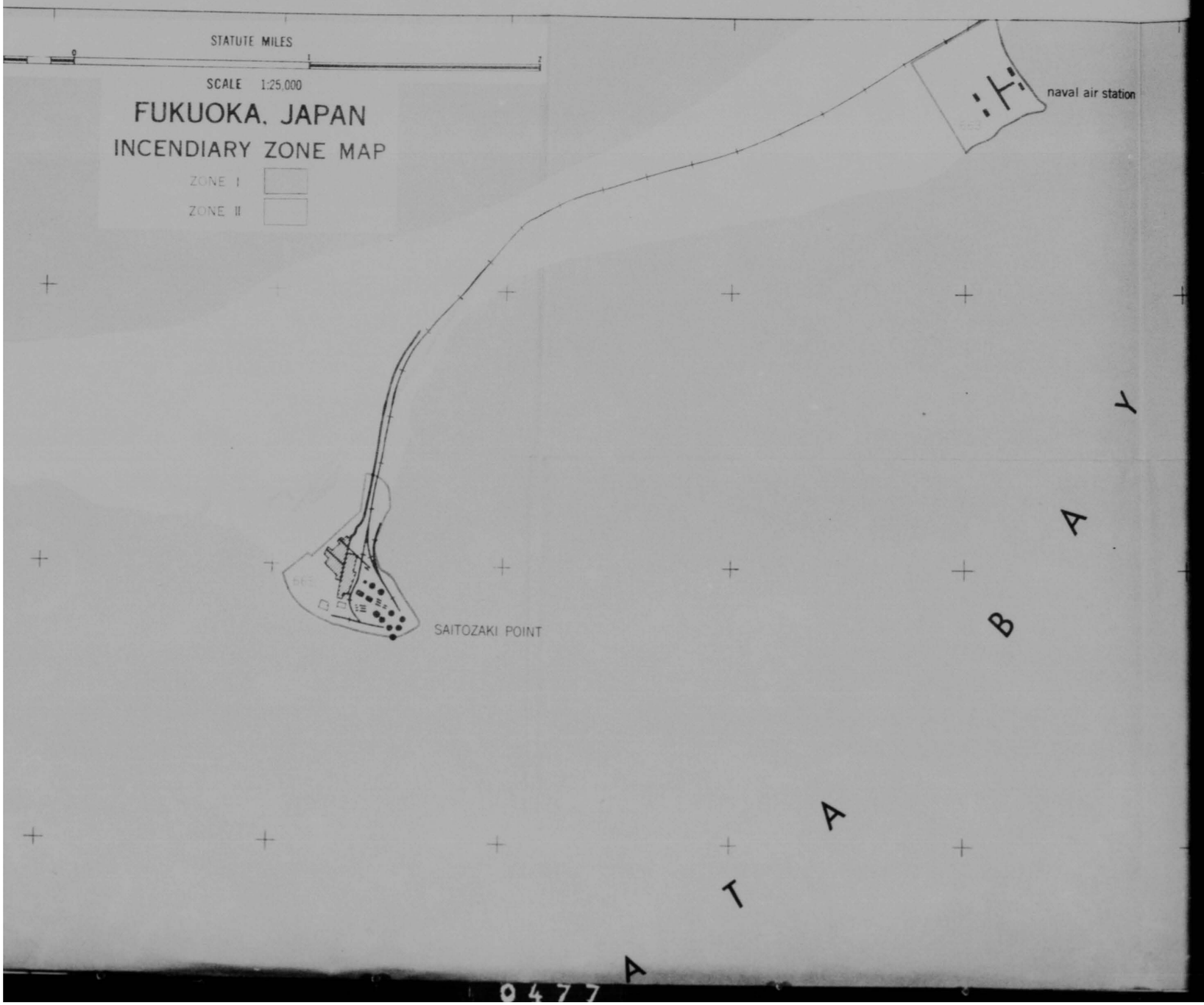


Part of industrial district in southern section of Fukuoka. Plant at lower left is Kanegafuchi Spinning Mill (Target 1271). Several small factories are visible in upper right. Looking south.

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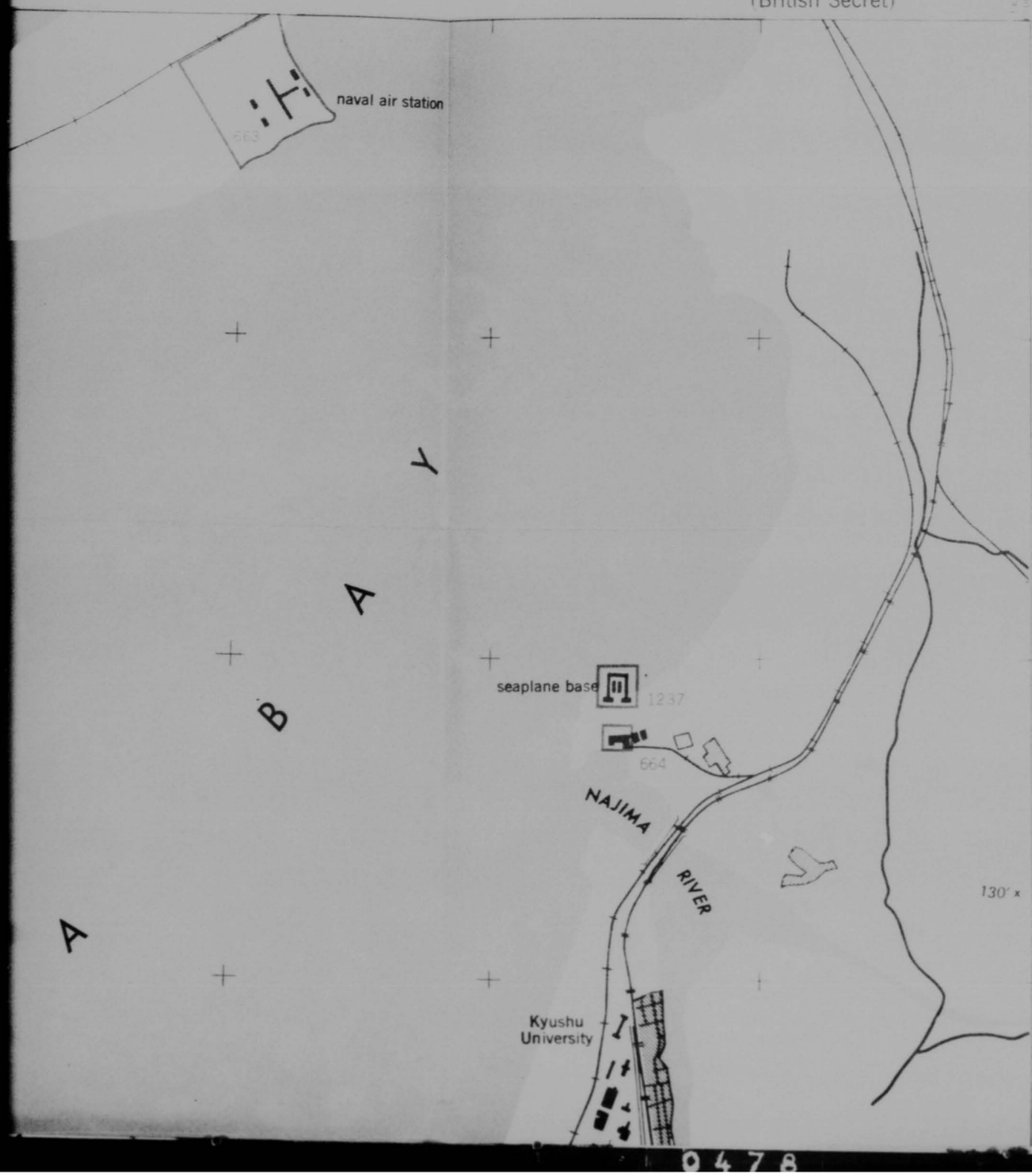
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FOR TARGET DETAILS SEE AIR OBJECTIVE FOLDER
KURUME AREA, NO. 36-35, ISSUED JAN. 3, 1945

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SELECTED TARGETS IN FUKUOKA CITY

Source: Air Obj. Folder, No. 90.35, Kurume Area, Issued Jan. 1, 1943

Target No.	Target Name	Significance	Zone - Vulnerability
	AIRPORTS		
1237	Najima Seaplane Base	Terminal Japan-Korea-Taiwan airline.	3c
	ARMS, MUNITIONS		
1238	Watsnabe Iron Works, Plant No. 1	Naval munitions, machinery, aircraft parts.	1a
1240	Watsnabe Iron Works, Plant No. 3	Naval munitions, etc.	3b
	ELECTRIC POWER		
804	Najima Steam Power Station	Important - 60,000 Kw.	3c
	HARBOR FACILITIES AND WAREHOUSES		
1255	Hakata Harbor	Secondary.	1a
	TRANSPORTATION		
1270	Hakata Railroad Station	Principal station Kurume area.	1a
	RUBBER		
1265	Nippon Rubber Company	Secondary production tin & rubber products.	3b
	TEXTILES		
1271	Kanegafuchi Spinning Company	Large.	1a

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March 1943

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NAGASAKI

Population - 252,630 (1940).

Location - NE head of Nagasaki Bay, at Latitude 32° 45' N., Longitude 129° 53' E.

Importance - Nagasaki is one of Japan's leading shipbuilding centers and a primary embarkation port. The city's shipyards built and equipped about 15% of all the ships (naval and merchantmen) launched in Japan during 1937-39. It is estimated that they employ at least 20,000 workers, the great majority of whom live in Nagasaki city. An important steel and naval munitions plant is also located here. The port of Nagasaki has been an embarkation port since the beginning of the war with China. Many warehouses have been built along the wharves to store military supplies.

The city is also the capital of Nagasaki Prefecture and the seat of its military and civil administration.

General Description - The city of Nagasaki occupies an amphi-theater-like site, and extends from the reclaimed land along the waterfront to the lower slopes of the surrounding hills. Business, commercial and industrial activities are concentrated in the areas of level land where the streets are fairly wide and regular. Prefectural and local administration buildings are located near the center of the city. Closely grouped and highly inflammable dwellings surround most of these public buildings and extend to the lower slopes of the hills. The streets in the higher levels of the city are very narrow and irregular, often broken by steps. Four rivers flow through the city into the Bay. All heavy industry is located west across the Bay, or NW of the city along the railroad line.

Fire Areas - Three separate fire areas are indicated.

Zone I - The entire built-up part of Nagasaki city constitutes a Zone I area. The heavy concentration of military warehouses along the waterfront adjoins the mercantile district. Public buildings extend through the center of the city in a general N/W direction. North and south of these, and interspersed among them, are 1 and 2 story workers' homes, so densely grouped as to look like a sea of roofs. Four rivers flowing in a general E-W direction and a relatively few wide avenues constitute the only effective fire breaks. There are no large industries in this zone and relatively few household industries.

Zone II - Zone II comprises two separate areas.

The northernmost area, near the Nagasaki railroad station, covers the railroad wharves and warehouses, railroad station and freight yard, a large cotton spinning mill and part of the site of a steel and naval munitions plant.

A second part of Zone II is located just SW across the Urakami River extending from the town of Inase to the village of Akunoura. The town of Inase, an industrial suburb of Nagasaki, is inhabited by shipyard workers and their families. It is also the site of a ship engine works, several small machinery plants and the Nagasaki area Military Commander's Headquarters.

The village of Akunoura is the site of the huge Mitsubishi (Akunoura) ship engine works (Target 542). This plant comprises approximately 40 closely grouped buildings, most of light metal sheeting over steel frames, some of wood and a few of reinforced concrete construction. Workers' homes extend westward from these buildings to the hills.

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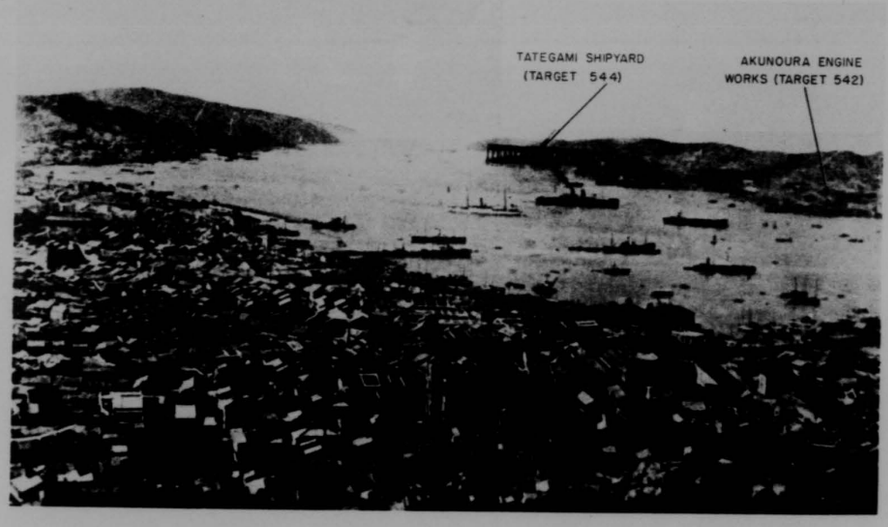
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NAGASAKI



Old view of the northern part of Nagasaki, Zone I fire area. A few substantial government buildings are scattered throughout the area now, and warehouses extend along the waterfront to the left, but congestion remains. Industrial suburb of Inase visible at upper left. View looks NW.



Old view of southern part of Nagasaki. Large warehouses now extend along reclaimed land on the waterfront. View has been retouched to alter skyline and to obliterate the Akunoura Engine Works across the bay. Looking south.

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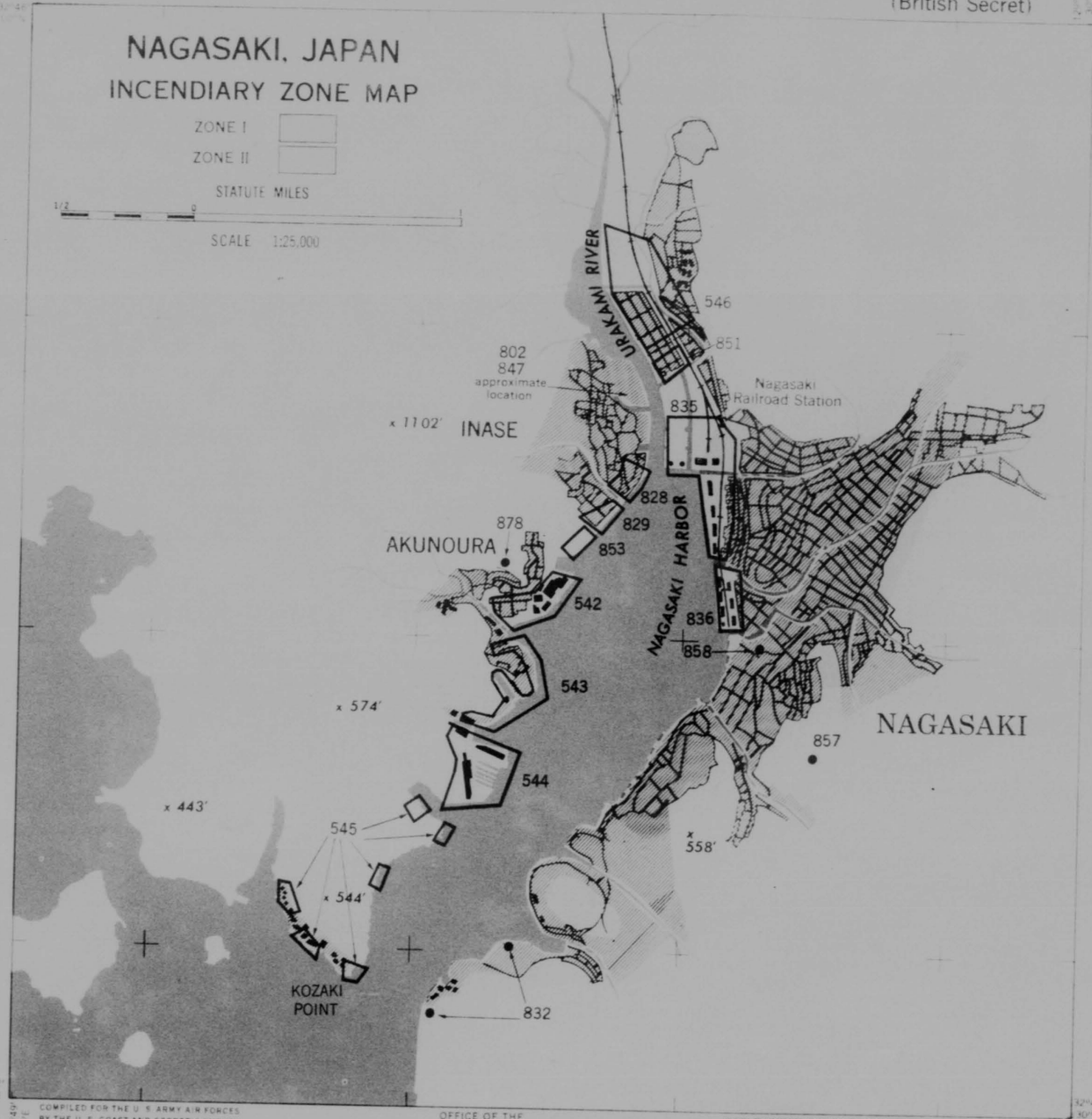
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NAGASAKI, JAPAN
INCENDIARY ZONE MAP

ZONE I
ZONE II

STATUTE MILES
1/2 0 1

SCALE 1:25,000



COMPILED FOR THE U. S. ARMY AIR FORCES BY THE U. S. COAST AND GEODETIC SURVEY WASHINGTON, D. C.

SEPTEMBER 1943

OFFICE OF THE ASSISTANT CHIEF OF AIR STAFF, INTELLIGENCE WASHINGTON, D. C.

FOR TARGET DETAILS SEE AIR OBJECTIVE FOLDER SASEBO AREA—NO. 90.36, ISSUED DEC. 15, 1942.

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SELECTED TARGETS IN NAGASAKI CITY

Source: Air Obj. Folder, No. 90.36, Sasebo Area, Issued Dec. 15, 1942

Target No.	Target Name	Significance	Zone - Vulnerability
	AIRCRAFT		
802	Mitsubishi Aircraft	Secondary production engines.	2b
	ARMS, MUNITIONS		
546	Mitsubishi Steel and Arms Works	Important, naval munitions	3b
	COMMUNICATIONS		
857	Radio JOAG	Minor importance.	3c
858	Nagasaki Post and Telegraph Office	Minor importance.	1a
	DEFENSES		
853	Nagasaki Command	Minor.	2c
	ELECTRIC POWER		
847	Nagasaki Steam Power Plant	Minor - 10,000 Kw.	2c
878	Nagasaki Substation No. 1 and No. 2	Minor.	3c
	HARBOR FACILITIES AND WAREHOUSES		
835	Nagasaki Wharves and Freight Yard	Important military traffic, terminus Shanghai run.	2a
836	Dejima Wharf	Secondary.	1a
	MACHINES AND MACHINE TOOLS		
829	Mitsubishi Electric Mfg. Co, Ltd.	Important, power plant equipment.	2b
	NAVAL BASES AND SHIPYARDS		
*542 544	Akunoura Engine Wks & Tategami Shipyard	Very important, marine engine production; naval & commercial shipbuilding.	2b
543	Mitsubishi Dock Yard	Important repair dockyard.	2b
828	Matsuo Engine Works	Secondary, marine engine production.	2b
	PETROLEUM		
545	Kozaki Point Oil Storages	Important.	3c
832	Megami Point Oil Storages	Small.	3c
	TEXTILES		
851	Nagasaki Spinning & Weaving Mill	Minor.	2a

Key Targets are Underlined. *Priority Targets. See Japanese Target Data, Issued March 1943

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APPENDIX A

CHARACTERISTICS OF U.S. INCENDIARY BOMBS

This study deals with small incendiary bombs concerning which considerable test data are available. The latest and most comprehensive controlled test is summarized in Report T.D.M.R. 713, "Tests of Incendiary Bombs AN-M50A1, AN-M52, AN-M54 and M69 at Dugway Proving Ground, Simpson Springs, Utah" (reference #12). This report covers tests conducted from May 17 to July 16, 1943 on sample Japanese and German structures.

Relative Efficiency of U.S. Incendiary Bombs

Report T.D.M.R. 713 concludes that four types of small U. S. incendiary bombs will start the following order of fires in Japanese cities at 50% roof coverage:

Bomb	No. Appliance Fires* Per 500-Lb. Cluster
M54	5
M50	10
M52	20
M69	20

These results were further evaluated by the Army Air Forces in a Secret memorandum entitled "Proceedings of a Committee Appointed by Direction of the Chief of the Air Staff to Study the Incendiary Situation", dated August 30, 1943. This memorandum concludes that (a) The M69 bomb is suitable for use against areas of light structures, (b) The M50 bomb is not suitable for use against light structures because of its extreme penetration, (c) The M52 bomb has no advantages over the M69 and (d) The M54 is not satisfactory as an incendiary bomb. These conclusions were approved by the Assistant Chief of Air Staff, Operations, Commitments, and Requirements, in a memorandum dated Sept. 1, 1943. These conclusions are the basis for the employment of M69 bomb data in the calculations made in this study.

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Report T.D.M.R. 713 was based on tests conducted against a small group of typical Japanese houses. In order to utilize these data for estimates relating to large cities, the following adjustments have been made:

(1) The different types of fires started in the Japanese test structures have been given the following weight factors, or probability of getting beyond control of the fire guards, and developing into appliance fires:

Class of Fire	Weight Factor
A1 fires (appliance fires within 0-2 minutes)	1.0
A2 fires (appliance fires within 2-4 minutes)	0.9
A3 fires (appliance fires within 4-6 minutes)	0.8
B fires (appliance fires in more than 6 minutes)	0.25
C fires (non-destructive even if unattended)	0.0

(2) It was assumed that about 50% of the buildings in a Japanese city are one-story structures.

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* An appliance fire is one which is beyond control by hand equipment, such as buckets, stirrup pumps, pump tanks, etc.; it requires attendance by a pumper or other major fire appliance.

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(3) It was assumed that roof overhangs constitute 15% of total roof area (rather than 25% as embodied in the test structures), which is in better accord with more complete data available in this study.

(4) Allowance was made for bombs bouncing off roofs (11% of total roof area contains heavy members), although none were observed to bounce off the test structures.

(5) All bombs which passed through overhangs plus those calculated to bounce off roofs were counted as misses in calculating the number of outside ejection hits.

(6) It was assumed that M69 bombs which miss structures will give outside ejection hits in the same proportion as the percentage of roof coverage. For example, at 60% roof coverage there will be 40% misses and of these, 60% will give outside ejection hits.

(7) It was indicated that outside ejection hits by M69 bombs will start the following classes of fires: 4% of A1, 2% of A2, 11% of A3, 28% of B, and 55% of C.

(8) It was indicated that M69 bombs coming to rest under structures start fires as follows: 11% of A1, 11% of A2, 11% of A3, 47% of B, and 20% of C.

The calculations which follow are based on the assumption of 100% bomb function (no duds). These calculations must be adjusted for this factor, concerning which accurate data are not available at the present time.

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Fire-Raising Effectiveness of M69 Bombs

On the basis of these calculations, the following working data were computed from T.D.M.R. 713:

Stopping Points of M69 Bombs in Two-Story Structures

Bounce off roof	11%
Stop in 2nd story or 2nd story hung ceiling	53%
Stop in 1st story or 1st story hung ceiling	20%
Through two stories into ground	3%
Through overhang	13%

Stopping Points of M69 Bombs in Built-Up Areas with 50% One-Story Structures

Bounce off roof	11%
Stop inside structures	63%
Through structures into ground	13%
Through overhangs	13%

Classes of Fires Started by M69 Bombs

Stopping Points	A1 Fires	A2 Fires	A3 Fires	B Fires	C Fires
Stopping inside structure	41%	30%	11%	7%	11%
Coming to rest on ground under structure	11%	11%	11%	47%	20%
Outside ejection hits; including misses, bombs bouncing off roofs & bombs passing through overhangs	4%	2%	11%	28%	55%

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For various percentages of roof coverage, M69 bombs are calculated to start the following types of fires:

Fires Started Per 500-Pound Cluster of M69 Bombs
In Typical Japanese Residential Construction

Types of Fires	-- Roof Coverage -- 30%	40%	50%	60%	70%
A1 fires	5	7	9	11	12
A2 fires	4	5	7	8	9
A3 fires	3	4	5	5	6
B fires	6	7	8	9	10
A & B fires	18	23	29	33	37
Appliance fires	13	17	21	24	27

This tabulation indicates that the M69 type of bomb meets the general requirements of fire raising mentioned in Part VI of this study. A bomb of this type should start a sufficient concentration of fires at all roof coverages contemplated for attack (30% or more), with a safety factor of more than two at the highest percentage of roof coverage.

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Data concerning the dispersion areas of quick-opening, 500-Lb. clusters of M69 bombs when dropped from altitudes of 10,000 ft. or more have been obtained from several tests (see reference Nos. 7, 12 and 13). Considering only the area which includes 90% of the bomb pattern, and omitting isolated or stray bombs, these tests indicate that the dispersion area of a 500-Lb. cluster is approximately 300 x 1200 ft.

Aimability of Small Incendiary Bombs

The use of small incendiary bombs in quick-opening clusters is most efficient at medium altitudes, because of the inferior ballistic properties of small incendiary bombs and the effect of wind drift. Tests conducted in this country indicate that these bombs are more aimable than had previously been supposed, although wind drift does introduce a relatively large factor of uncertainty. It is believed, however, that the average wind drift is a negligible factor for the type of pattern bombing discussed in this study, where the relative position of the cluster patterns is of much more importance than the exact placement of each cluster. For most of the incendiary zones indicated in this study, a wind drift of even 1/4 mile would not have a major bearing on the result.

However, the use of aimable clusters must be considered. Clusters of this type are available for use with small incendiary bombs of the M69 type. Such clusters permit greater accuracy of pattern placement from high altitudes. The use of such clusters would not alter materially the conclusions of this study. If the sample attack discussed herein were employed, the principal change would be the setting of smaller but more concentrated fire areas, spaced farther apart. Each of these fire areas would be beyond control almost immediately, which might have some intrinsic advantages over the pattern obtained with quick-opening clusters.

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APPENDIX B

NOTE REGARDING ADVISERS ON THIS REPORT

Many of the conclusions in this report depend in a large measure on certain estimates and technical knowledge regarding incendiary bombs, fire vulnerability and fire defenses in Japanese cities, fire vulnerability of industrial targets, etc. The principal consultants have been the following:

(1) Dr. R. H. Ewell, Technical Aide, Incendiaries Section, National Defense Research Committee. Dr. Ewell has had extensive experience in designing and testing incendiary bombs and has witnessed numerous tests. He has made a study of, and has written papers on, incendiary bombing tactics, and in 1942 spent several months in England studying this subject. He has collaborated in the preparation of the text and is primarily responsible for Parts V and VI of this study.

(2) Mr. Boris Laiming, who is a geologist by profession, has studied fires and fire protection for the past twenty-five years, particularly in Japan, but also in Russia, Germany and the United States. He is a member of the National Fire Protection Association and has contributed numerous articles to the N.F.P.A. Quarterly. Mr. Laiming lived in Tokyo and Yokohama and witnessed the great earthquake-fire of 1923. Subsequently he wrote a detailed report on this fire, which was accepted by the U.S. National Board of Fire Underwriters as their official report.

(3) Mr. Horatio Bond, Chief Engineer, National Fire Protection Association. Mr. Bond is an expert on fires and fire protection and has had wide contact with war-time fire problems as consultant to the Office of Civilian Defense, the Office of Strategic Services, and the National Defense Research Committee.

(4) Mr. N. J. Thompson, Research Director, Associated Factory Mutual Fire Insurance Companies. Mr. Thompson is an authority on industrial fires. He has also had wide experience in the design and testing of incendiary bombs as a member of the Incendiaries Committee of the N.D.R.C. for the past two years.

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HEADQUARTERS OF THE ARMY AIR FORCES
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ENCLOSURES

(1) Map of Incendiary Zones in Japanese Cities

(2) Diagram of Bomb Pattern, scale 1:25,000

(3) Diagram of Bomb Pattern, scale 1:35,000

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ZONE I—COMMERCIAL

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FIG. 1 —KOBE—MODERN, FIRE RESISTIVE STRUCTURES IN CENTRAL COMMERCIAL DISTRICT INTERSPERSED AMONG MASSES OF LOW, COMBUSTIBLE HOUSES. SWEEPING FIRES WOULD DEVASTATE ENTIRE AREA.



ZONE I *Includes central comme*
residential areas. On an
Zone 1
(a) has a population de
mile,
(b) has a roof coverage
(c) occupies 0.27 squa
population,
(d) includes 25% of the
(e) requires 6 tons of i
complete destructi
ditions.)

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INCENDIARY ZONES IN JAPANESE CITIES

ZONE I *Includes central commercial district and congested inner residential areas. On an average for a number of cities, Zone I*

- *(a) has a population density of 91,000 persons per square mile,*
- *(b) has a roof coverage of 50-80%,*
- *(c) occupies 0.27 square mile per 100,000 of total city population,*
- *(d) includes 25% of the total city population and*
- *(e) requires 6 tons of incendiaries per square mile for complete destruction (under average weather conditions.)*

ZONE II *Includes less congested residential warehouse districts and many industri age for a number of cities, Zone II*

- *(a) has a population density of 54,0 mile,*
- *(b) has a roof coverage of 30-50%,*
- *(c) occupies 0.85 square mile per population,*
- *(d) includes 46% of the total city po*
- *(e) requires 10 tons of inceniaries complete destruction (under a ditions.)*

ZONE III *Comprises all the non-incendiary areas outside of Zones I and II, including sparsely-settled suburban areas, large parks, non-combustible industrial districts and fireproof commercial districts (Tokyo and Yokohama only).*



TYPICAL CITY

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ONE II

Includes less congested residential areas, most dock and warehouse districts and many industrial areas. On an average for a number of cities, Zone II

(a) has a population density of 54,000 persons per square mile,

(b) has a roof coverage of 30-50%,

(c) occupies 0.85 square mile per 100,000 of total city population,

(d) includes 46% of the total city population and

(e) requires 10 tons of inceniaries per square mile for complete destruction (under average weather conditions.)

y areas outside of Zones I burban areas, large parks, and fireproof commercial y).

ZONE II RESIDE



FIG. 8 – KOBE – LESS CONGESTED RESIDENTIAL AREA, SHOWING BETTER-SPAC AND SOME TREES. CONSTRUCTION LARGELY WOOD, BUT MORE BRICK AND PL



TYPICAL CITY

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NE II RESIDENTIAL



GESTED RESIDENTIAL AREA, SHOWING BETTER-SPACED HOUSES, WIDER STREETS
RUCTION LARGELY WOOD, BUT MORE BRICK AND PLASTER USED THAN IN ZONE I.



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FIG. 2 —TOKYO—COMMERCIAL DISTRICT, TRANSITION BETWEEN NON-INCENDIARY (FIREPROOF) AREA, OFF VIEW TO LEFT, AND HIGHLY COMBUSTIBLE RESIDENTIAL DISTRICT IN UPPER RIGHT. NOTE PROXIMITY OF COMBUSTIBLE STRUCTURES TO LARGE, FIRE-RESISTIVE BUILDINGS.



FIG. 3 —OSAKA— VIEW OF CENTRAL COMMERCIAL DISTRICT, SHOWING CHEAPER MERCANTILE AREA IN FOREGROUND. MOST STRUCTURES IN FOREGROUND ARE LARGELY OF WOODEN CONSTRUCTION, HIDDEN BEHIND BRICK OR PLASTER FRONTS.



ZONE I—CONGESTED RESIDENTIAL DIST





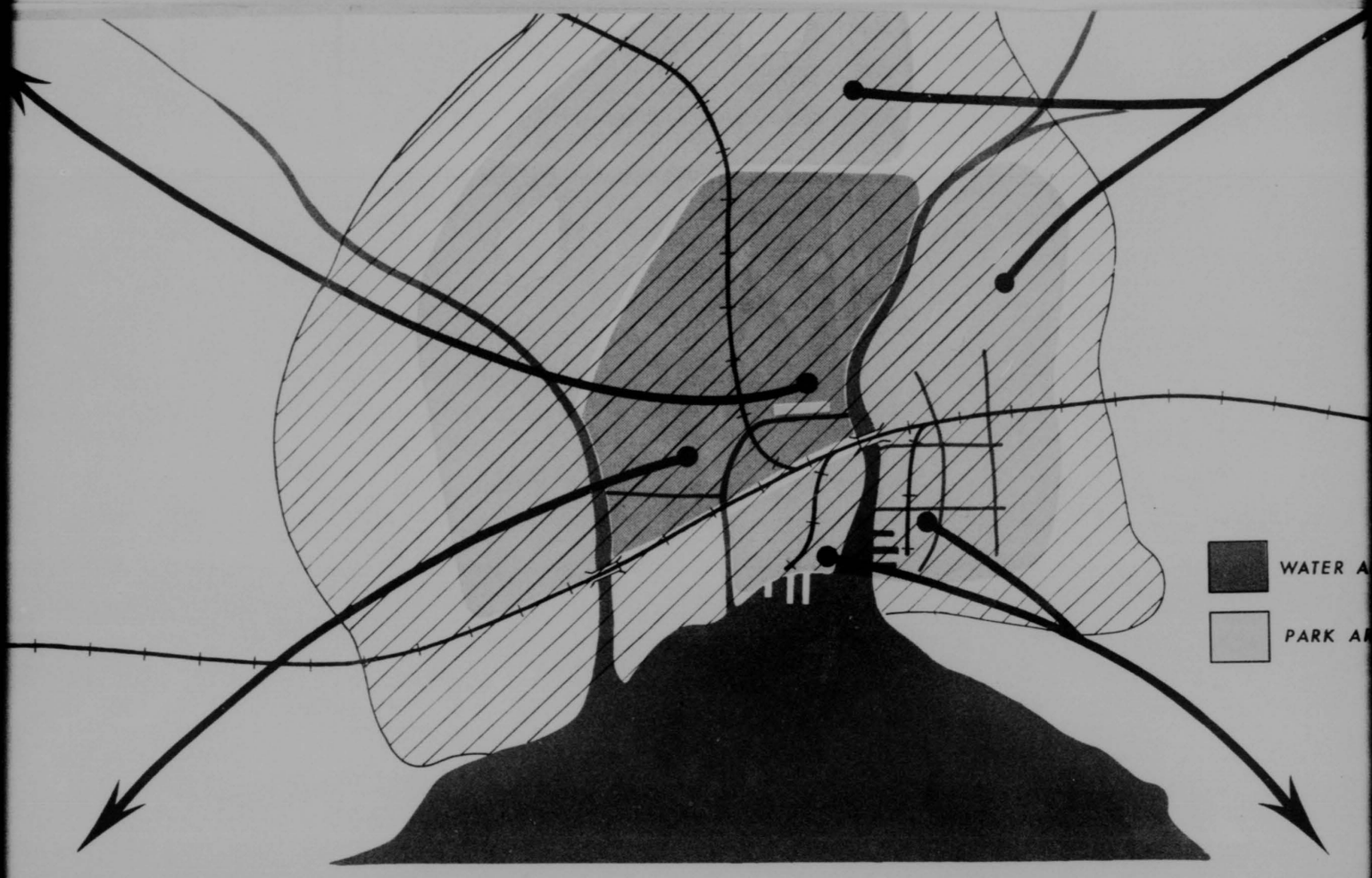
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ENTIAL DISTRICT

ZONE II—INDUST





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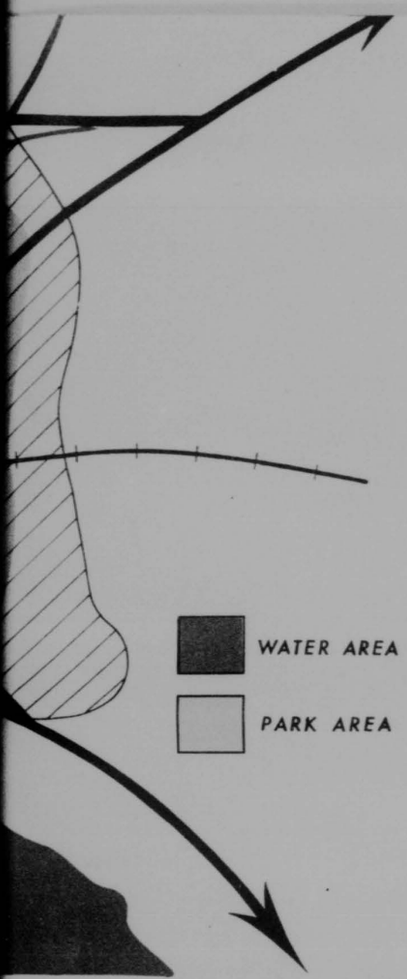




FIG. 9 —TOKYO— UPPER CLASS RESIDENTIAL DISTRICT NW OF IMPERIAL PALACE. RIVER AND WIDE STREET ARE EFFECTIVE FIRE BREAKS.



FIG. 10 —NAGOYA— BETTER-SPACED RESIDENCES ON THE FRINGE OF THE DOWNTOWN COMMERCIAL DISTRICT. WIDE STREET AND TREES REDUCE HAZARD OF SPREADING FIRES, BUT HOUSES ARE HIGHLY COMBUSTIBLE.

E II—INDUSTRIAL AND WAREHOUSE AREAS





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FIG. 4 — FUKUOKA — TYPICAL OF CENTRAL PART OF MANY CITIES HAVING A POPULATION OF 200,000-400,000. A FEW MODERN BUILDINGS ON MAIN STREET ADJOIN MASSES OF WOOD AND ADOBE HOUSES.



FIG. 5 — TOKYO — DENSE RESIDENTIAL AND MERCANT
RESISTIVE (NOT FIREPROOF) STRUCTURES FRONTING ON
TO CONFLAGRATION.



FIG. 6 — TOKYO — ILLUSTRATING LAYOUT OF HOUSES, UNIT BLOCKS AND STREETS IN ZONE I. THIS TYPE OF AREA HAS A POPULATION DENSITY IN EXCESS OF 100,000 PER SQUARE MILE AND A ROOF COVERAGE OF 75%.

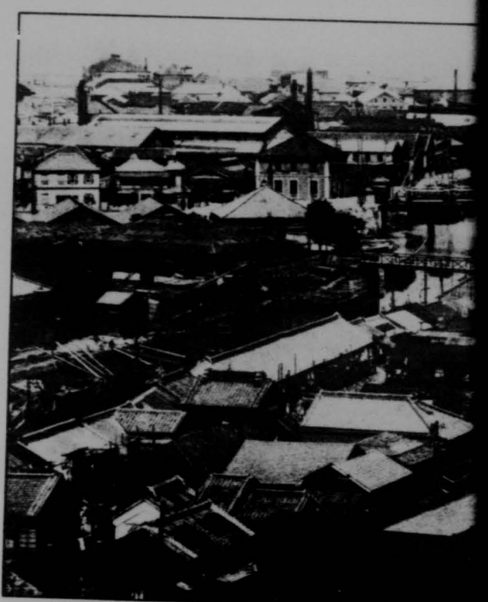


FIG. 7 — YOKOHAMA — TYPICAL CONGESTION OF ONE
IN ABSENCE OF WIND, CANAL MAY ACT AS FIRE BR
NOTE SMALL FACTORIES AT UPPER LEFT.

SEPTEMBER 1943

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– DENSE RESIDENTIAL AND MERCANTILE DISTRICT ALONG SUMIDA RIVER. MANY FIRE EPROOF) STRUCTURES FRONTING ON WIDE STREETS, BUT ENTIRE AREA IS SUSCEPTIBLE N.

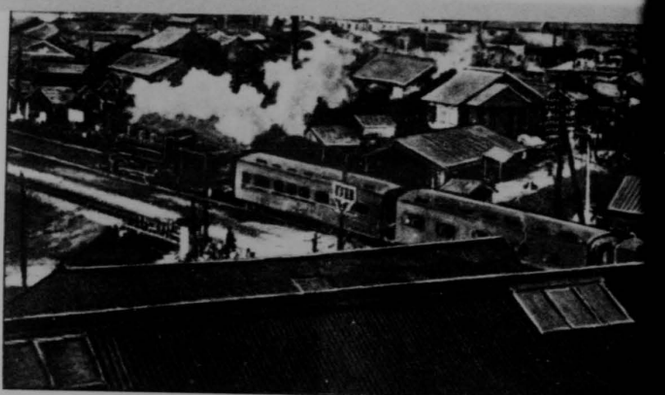


FIG. 11 —NAGOYA— LARGE FACTORIES SURROUNDED BY WORKERS' HOMES. DISTRICTS IN ZONE II.



A — TYPICAL CONGESTION OF ONE AND TWO STORY DWELLINGS IN ZONE I. IND, CANAL MAY ACT AS FIRE BREAK, BUT NARROW STREETS WOULD NOT. ORIES AT UPPER LEFT.



FIG. 13-TOKYO-CONGESTED FACTORY AREA IN SE PART OF CITY, WITH WORKERS NOTE FIRE OBSERVATION TOWER IN CENTER.

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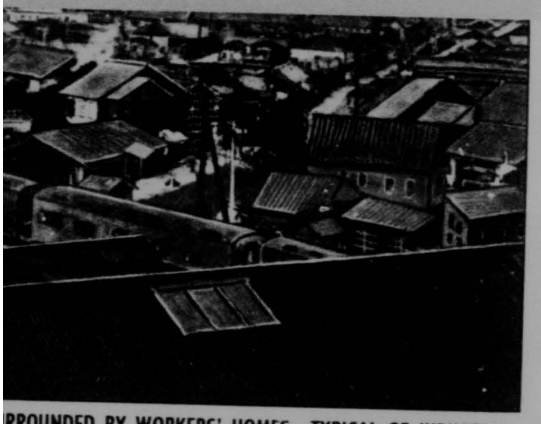
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RROUNDED BY WORKERS' HOMES. TYPICAL OF INDUSTRIAL



FIG. 12—OSAKA—SMALL FACTORY SECTION, SHOWING UNBROKEN MASS OF COMBUSTIBLE STRUCTURE WITH NO EFFECTIVE FIRE BREAKS. IN EFFECT, WORKERS' HOMES HERE CONSTITUTE "KINDLING" FO DESTRUCTION OF FACTORIES.



SE PART OF CITY, WITH WORKERS' HOMES IN DISTANCE.



FIG. 14—OSAKA—MAIN WATERFRONT STORAGE AREA, WITH CONGESTED RESIDENTIAL DISTRICT AT RIGHT. STOREHOUSES ARE EASILY PENETRATED BY SMALL INCENDIARIES, AND CONTENTS ARE PROBABLY COMBUSTIBLE.

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MASS OF COMBUSTIBLE STRUCTURES
ERE CONSTITUTE "KINDLING" FOR



STED RESIDENTIAL DISTRICT AT RIGHT.
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Japan
Concentrated Target Areas

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TOKYO-KAWASAKI-YOKOHAMA

SELECTED TARGET CONCENTRATIONS

Installations within approximately 4,000 ft. of the center target are listed for each cluster. Included in each cluster are some of the objectives of primary significance (in addition to the target proper), a number of other listed installations and many [illegible] plants, chosen on the basis of their industrial or transport importance. Omitted are small plants of little significance, and those installations of the target area which, upon reconnaissance, the selected aircraft may also include or which may be used for [illegible] bombs.

TOKYO

Key machine tool and diesel engine plant of the important Nihonmi concern, Target 916 is located in a mixed industrial/residential section of Tokyo, also significant for chemical, machinery, petroleum and textile installations.

TARGET NO.	NAME
916	- Nihonmi Engineering, Kamata Plant
1358	- Tokyo Kosai Co. (steel & forgings)
1352	- Iron Works (Four general machinery plants)
920	- Nihon Oil Storage
918	- Nichiboku Gas Petroleum Terminal
919	- Hinode Spinning Mills
914	- Oriental Weaving Co.
913	- Oriental Weaving Co.

Not designated on Map, but located within approximately 4000 ft. of Target 916 are the following installations:

Japan Chemical Industry Co.
Taisei Chemical Industry (fertilizer)
Yoshinaga Chemical Equipment Co.
Oriental Steel Works (steel plate)
Ishii Iron Works
Tamura Engineering Works (machinery)
Mitsubishi Kosai (spring steel)
Kokuka Wire and Cable Co.
Japan Casting Co.
Tokyo Gas Works (Coke, coal tar by-products)
Asahi Oil Refinery (light lube oil)
Japan Mineral Oil Co.
Hitachi Rubber Co.
Several Spinning Mills, storehouses, etc.

Ⓐ

One of the four leading Japanese electronic equipment plants, Target 326 is located in a congested industrial/residential district of Tokyo, also important for machinery and machine tools, aircraft and automotive parts, communications equipment and port facilities.

TARGET NO.	NAME
326	- Nippon Electric Co. Factory No. 2
889	- Nippon Electric Co, Plant No. 3
888	- Oki Electric Co, Plant No. 1
327	- Mitsubishi Aircraft, Shibaura Plant (Aircraft electrical equipment)
324	- Shibaura Machine Tool Co
1351	- Tokyo Engineering Co (Ordnance and Aircraft Parts)
890	- Tokyo Machinery Co.
893	- Diesel Motor Plant (small gas engines)
1345	- Tokyo Municipality Steam Power Plant
896	- Hinode Pier (wharves and warehouses)
897	- Shibaura Wharf (wharves and warehouses)
344	- Shinagawa RR Yards

Not designated on Map, but located within approximately 4000 ft of Target 326 are the following installations:

Oriental Radio Instrument Co.
Oki Electric Co (Auxiliary to Target 888)
Kamifuji Iron Works (Aircraft parts and tools)
Asahina Iron Works (Aircraft parts)
Tokyo Machinery Works
Tokyo Screw Co
Tamura Auto Co. (Auto parts)
Imperial Auto Parts
Toyota Auto Equipment Co.
Japan Pipe Co.
Tokugawa Bridge Construction Co.
Tokyo Gas Works
Sewage Pumping Plant
Telephone Exchange
Cold Storage Plant
Kinoshita Ice Co.
Enoshiu Sugar Co.

Ⓑ

Large machine tool and diesel engine plant of the leading Niigata Machine Tool concern, Target 918 is located in a predominantly industrial section of Tokyo which includes numerous other plants manufacturing machinery, machine tools, precision instruments and ordnance components.

TARGET NO.	NAME
918	- Niigata Iron Works
1353	- Rolling Stock Co (R.R. equipment and heavy ordnance components)
341	- Oriental Otis Elevator Co. (machine tools and ordnance)
373	- Miyata Engineering Works (Aircraft parts)
919	- Tokyo Measuring Instrument Co. (Precision aircraft and marine instruments)

Not designated on Map, but located within approximately 4000 ft. of Target 918 are the following installations:

Nihon Machinery Co.
Nihon Pneumatic Machine Co.
Shibaura Precision Machine Co.

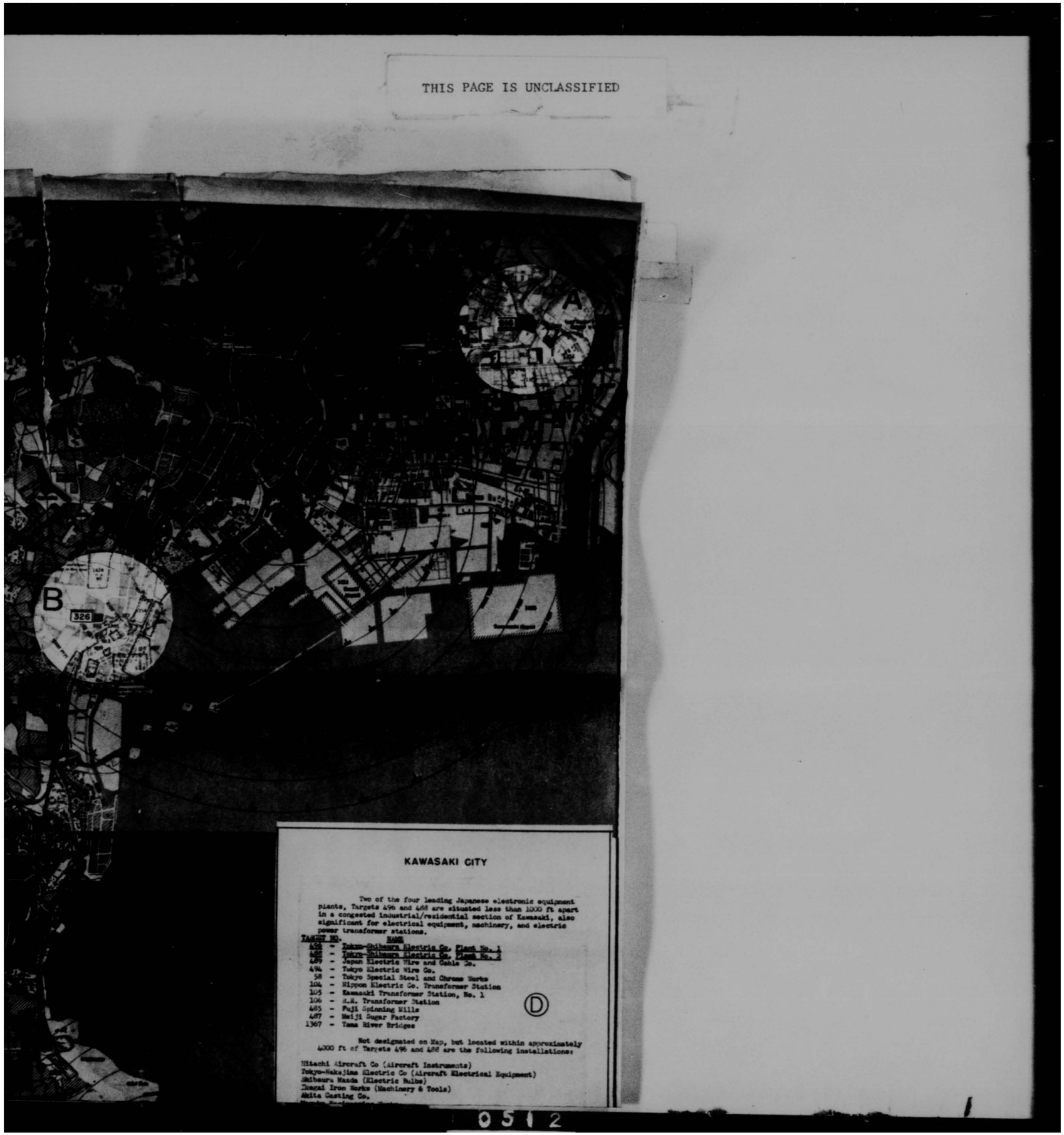


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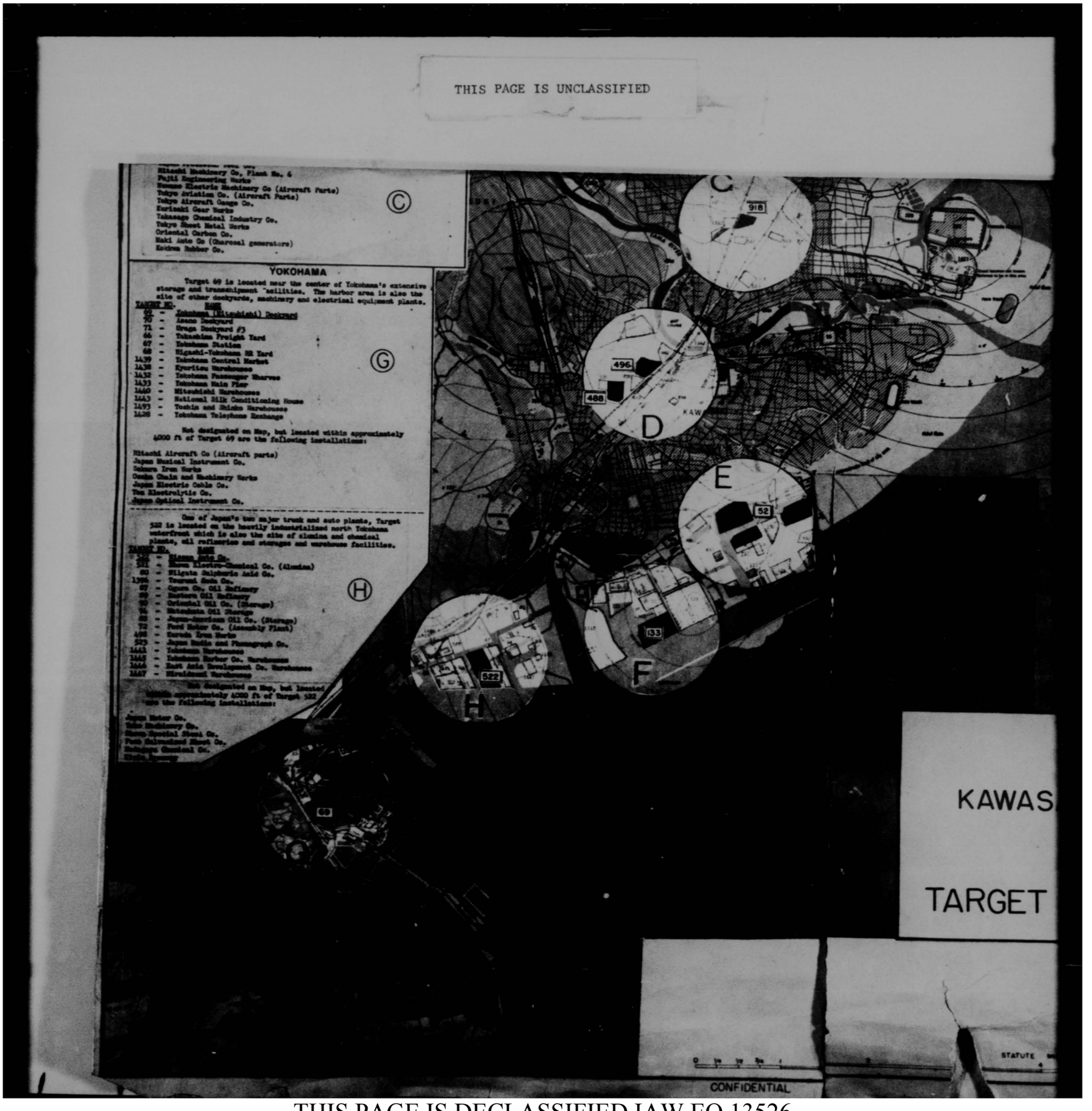


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Oriental Radiator Co.
Kawasaki Rubber Co.
Vegetable Oil Plant

One of the six major steel works in Japan Proper, Target 52 is located on the heavily industrialized Kawasaki waterfront. In the immediate vicinity are three of the four principal steam power plants in the Tokyo Area, important oil refining and storage facilities, large chemical and cement plants.

TARGET NO.	NAME
52	- Japan Steel Tube Co (Integrated iron/steel/fabricating)
110	- Tsurumi Steam Power Plant
111	- Kawasaki Steam Power Plant
493	- Tokyo Steam Power Plant
136	- Fuji Electric Works (Wire and Cable)
57	- Oriental Steel Products
130	- Asahi Petroleum Storage
147	- Aikoku Petroleum Refinery
127	- Nayama Oil Refinery
116	- Mitsubishi Oil Refinery
1437	- Mitsubishi Warehouses
141	- Mitsubishi Coal Depot
137	- Showa Fertilizer Co.
475	- Asano Cement

Ⓔ

Not designated on Map, but located within approximately 4000 ft of Target 52 are the following installations:

Tokunaga Glass Co.
Japan Casting Co.
Mitsubishi Chemical Equipment Co.
Nisshin Flour Mills

Japan's largest heavy electrical equipment works, Target 133 is located on the heavily industrialized Kawasaki waterfront. In the immediate vicinity are important oil refining and storage facilities, as well as machinery, shipbuilding and communications equipment plants.

TARGET NO.	NAME
133	- Shibaura Engineering Works (Heavy turbines and electric generators, large machine tools, munitions components)
128	- Petroleum Center (Refining and Storage)
481	- Tokyo Gas Co, Tsurumi Works
1351	- Tokyo - Nakayama Iron Works
51	- Asano Iron Works (supplies Target 122)
122	- Tsurumi Shipbuilding Co.
1343	- Ishikawajima Motor Co. (Auto & Aircraft Parts)
109	- Oki Electric Co, Plant No. 2 (Communications equipment)
135	- Coop. Auto Works
117	- Mitsubishi Oil Storage
1337	- Tsurumi Army-Navy Stores

Ⓕ

Not designated on Map, but located within approximately 4000 ft of Target 133 are the following installations:

Tokyo Auto Parts Co.
Japan Casting Co.
Tsurumi Soda Co.
Tsurumi Brick Works.

TOKYO
KAWASAKI — YOKOHAMA
SELECTED
TARGET CONCENTRATIONS

TARGET INFORMATION SECTION
24 OCTOBER
1944

STATUTE MILES

IDENTIAL

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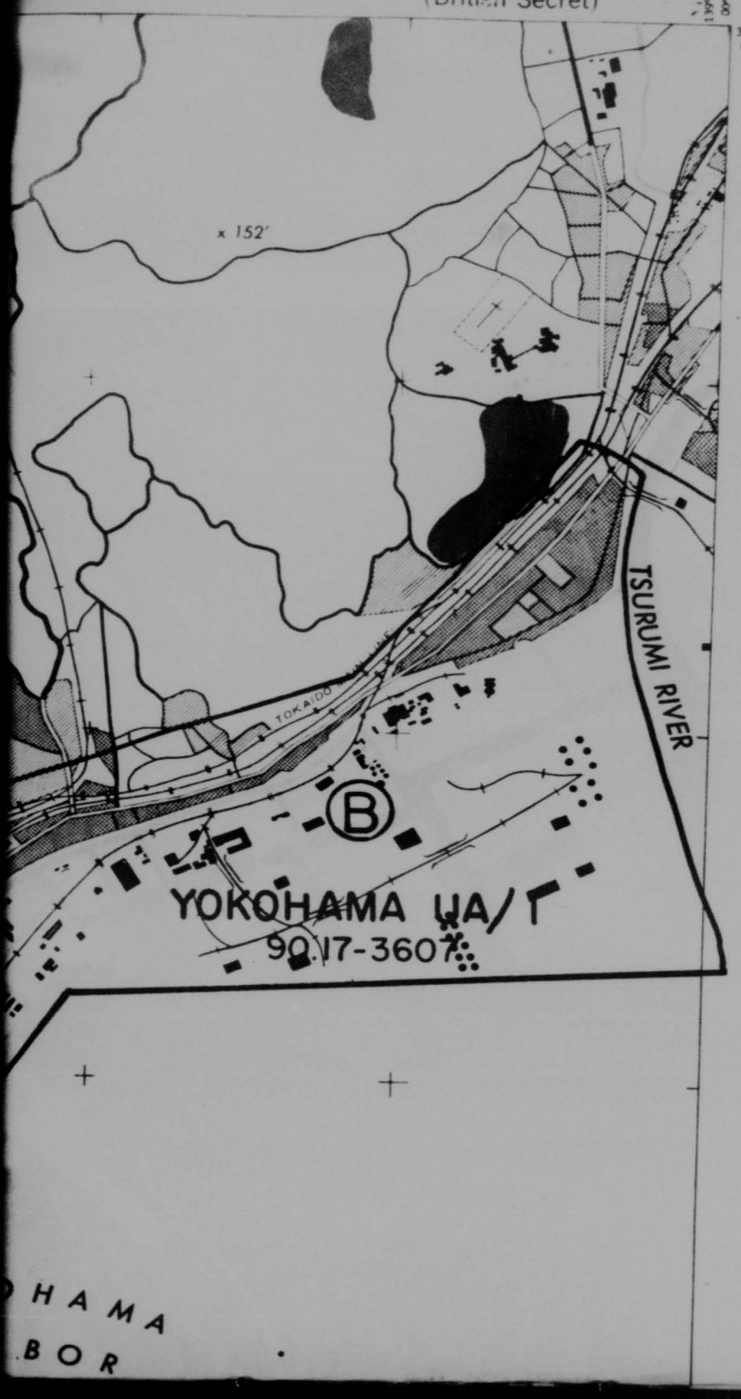
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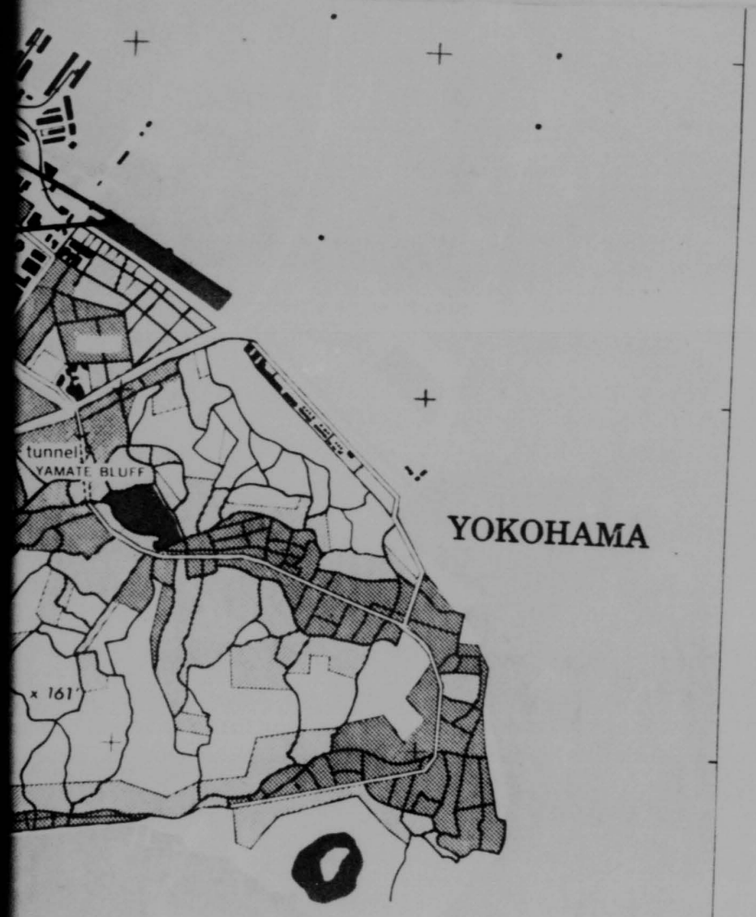


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YOKOHAMA, JAPAN

INCENDIARY ZONE MAP

ZONE II

STATUTE MILES

SCALE 1:25,000

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CHIEF OF AIR STAFF, INTELLIGENCE
WASHINGTON, D. C.

35°23'
30"N

139°41'
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KA AREA

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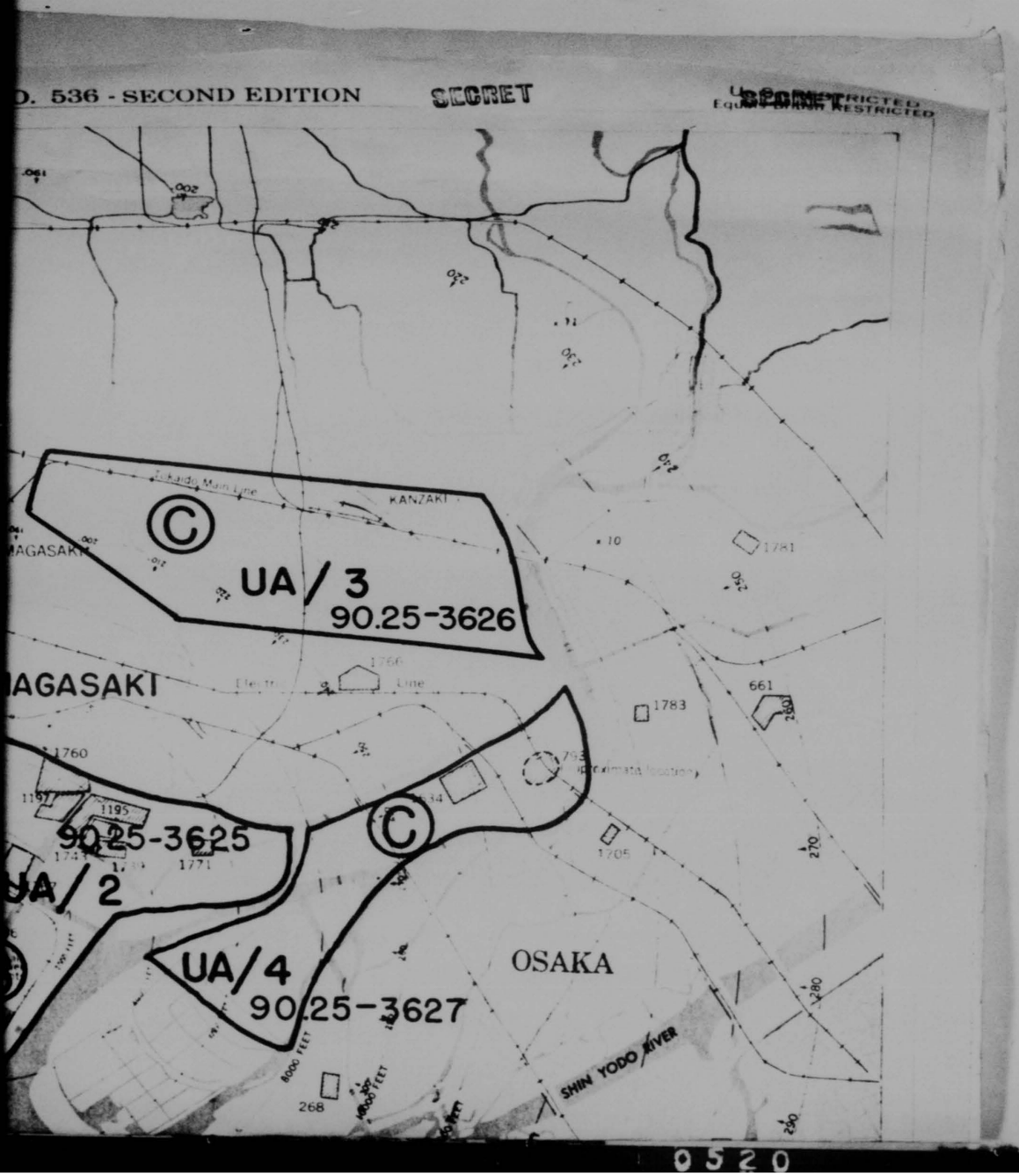


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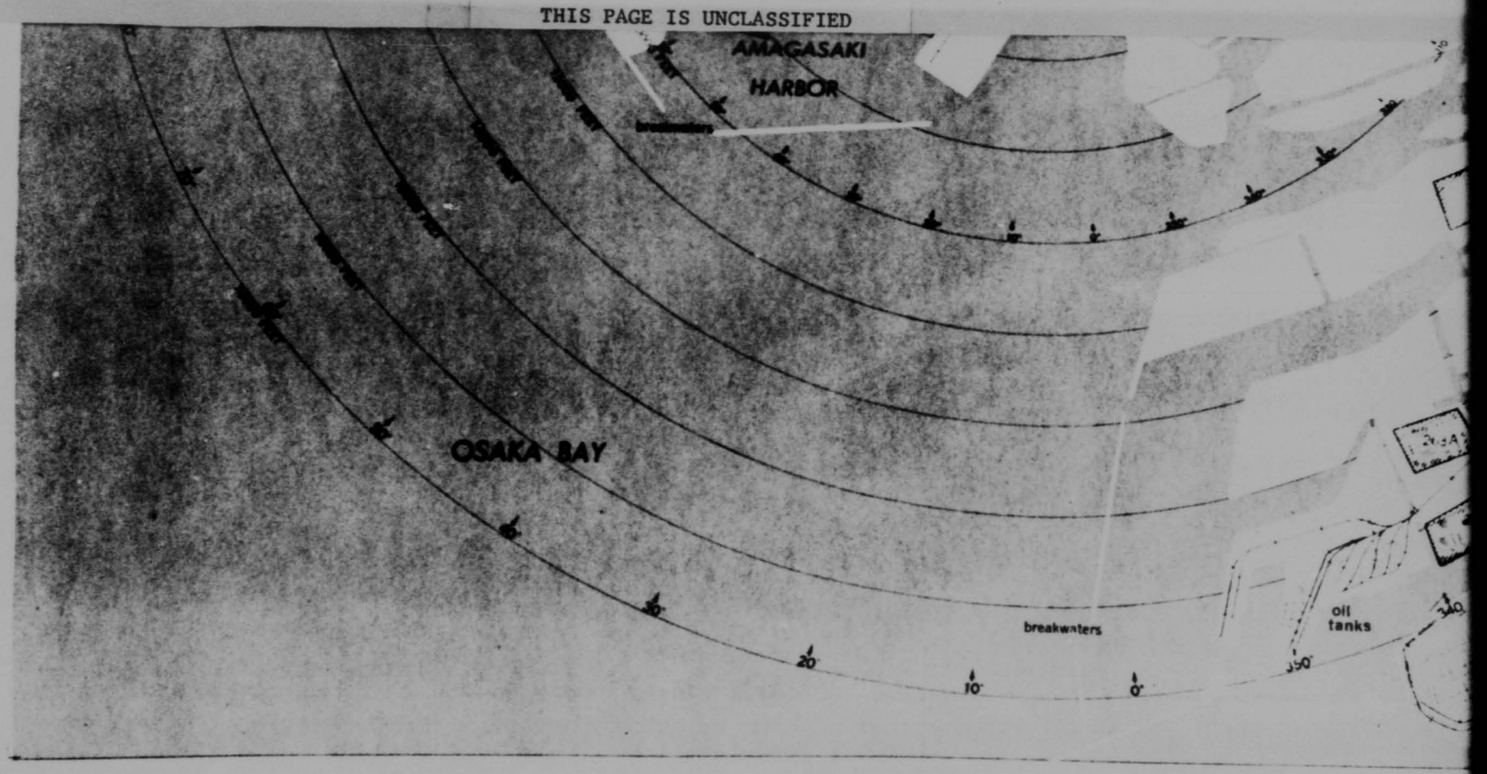


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TARGET NUMBER	TARGET DESIGNATION	TARGET ELEVATION
	TARGET LYING WITHIN 5 MILES OF CENTER OF CHART	
536	Amagasaki Steam Power Plant	15'
18	Kawanishi Aircraft Co.	15'
241	Standard Vacuum Oil Storage & Nippon Oil Storage	10'
242	Sumitomo Electric Industries Co.	10'
263A	Sumitomo Metal Industry & Sumitomo Aluminum Co.	10'
264	Sumitomo Metal Industry	10'
268	Osaka Steel Mfg. Co.	15'
272	Osaka Iron Works Unit No. 1	10'
522	Katsugade No. 1 Steam Power Plant	10'
523	Katsugade No. 2 Steam Power Plant	10'
540A	Kansai Kyodo Steam Power Plant No. 1	15'
540B	Kansai Kyodo Steam Power Plant No. 2	10'
548	Rolling Stock Mfg. Co.	10'
661	Amatsuji Steel Ball Mfg. Co.	10'

1744	Sumitomo Metal Industry	10'
1747	Kubota Iron and Machinery Works	10'
1761	Nippon Oil Refinery and Tank Farm	10'
1764	Mitsubishi Gear Works	10'
1765	Steel Engineering Works Co.	10'
1767	Kubota Iron & Machinery Co.	10'
1734	Japan Dye-Stuff Mfg. (Dye Plant)	10'
1734	Japan Dye-Stuff Mfg. (Drug) Plants	10'
1784	Fuji Kogyo Electrical Co.	10'
1743	Dai Nichi Electric Wire Co.	10'
1748	Showa Electrode Co.	10'
1760	Asahi Glass Co.	10'
1766	Daido Steel Mfg. Co.	10'
1767	Tokyo Rolling Works	10'
1769	Amagasaki Steel Works	10'
1771	Nakayama Steel Mfg. Co.	10'
1776	Kubota Iron and Machinery Works	10'
1781	Osaka Machinery Co.	10'
1785	Osaka Wakayama Iron Works	10'

COMPASS ROSE INDICATES MAGNETIC BEARING TOWARD THE TARGET

AUGUST 1944
(SECOND EDITION)

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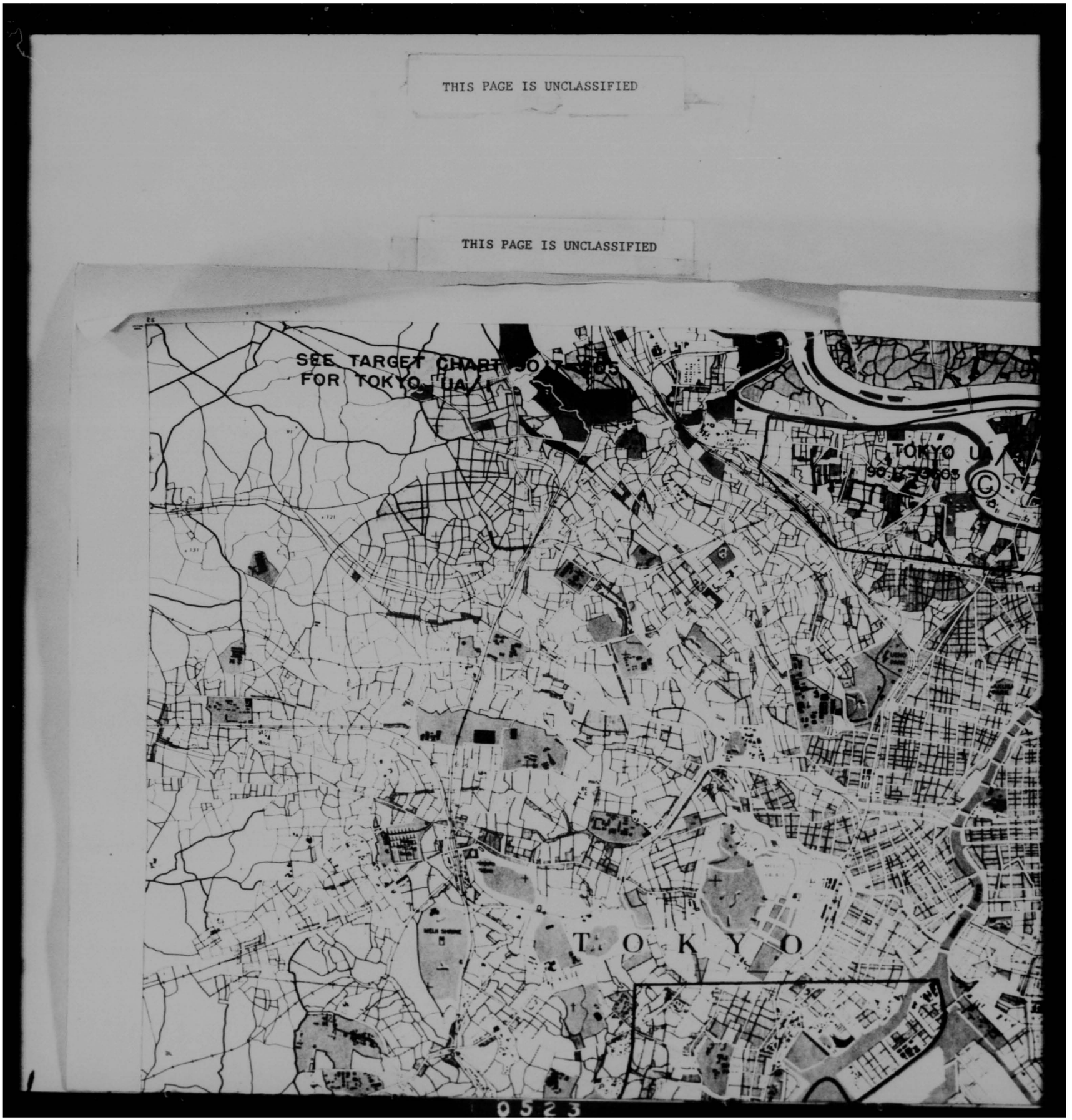
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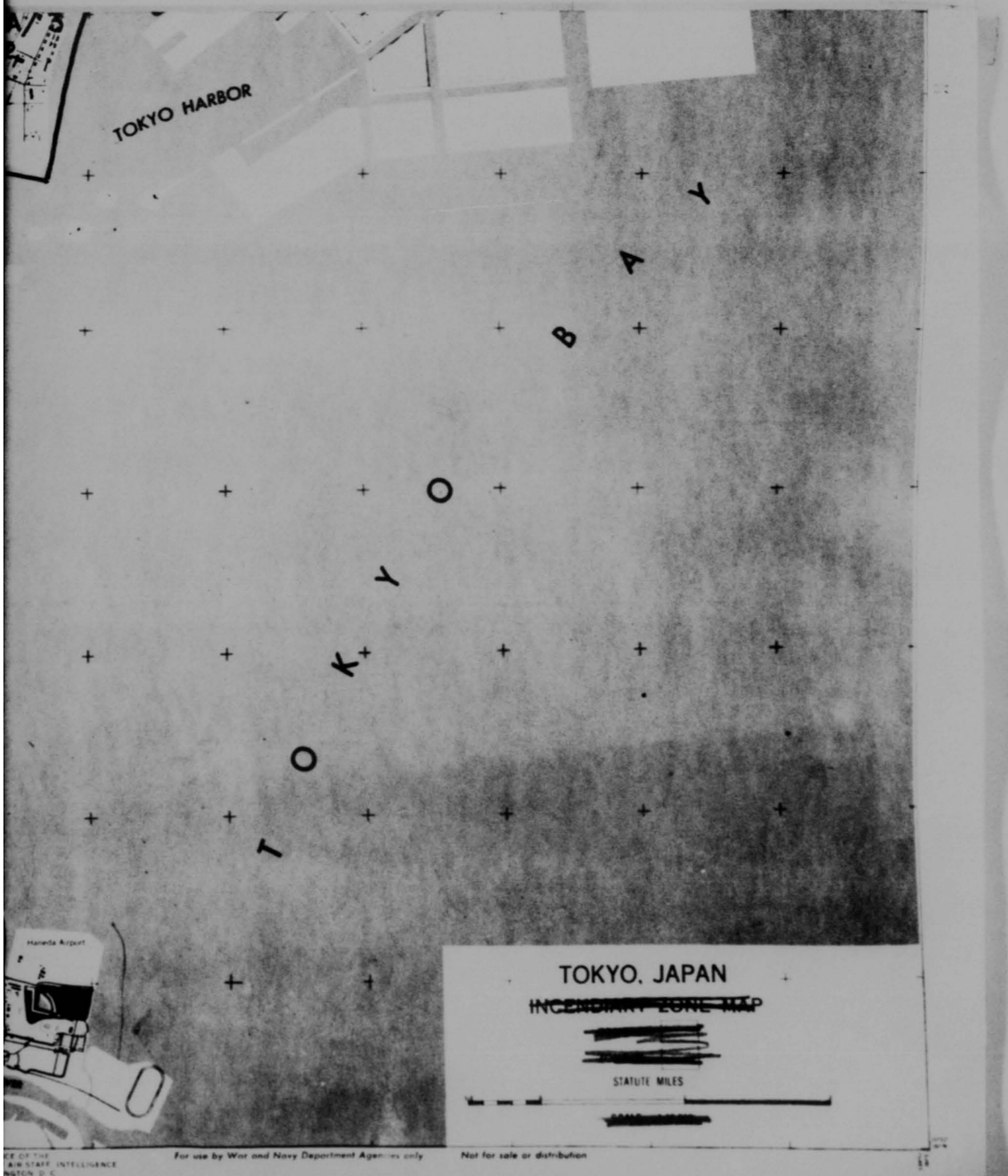


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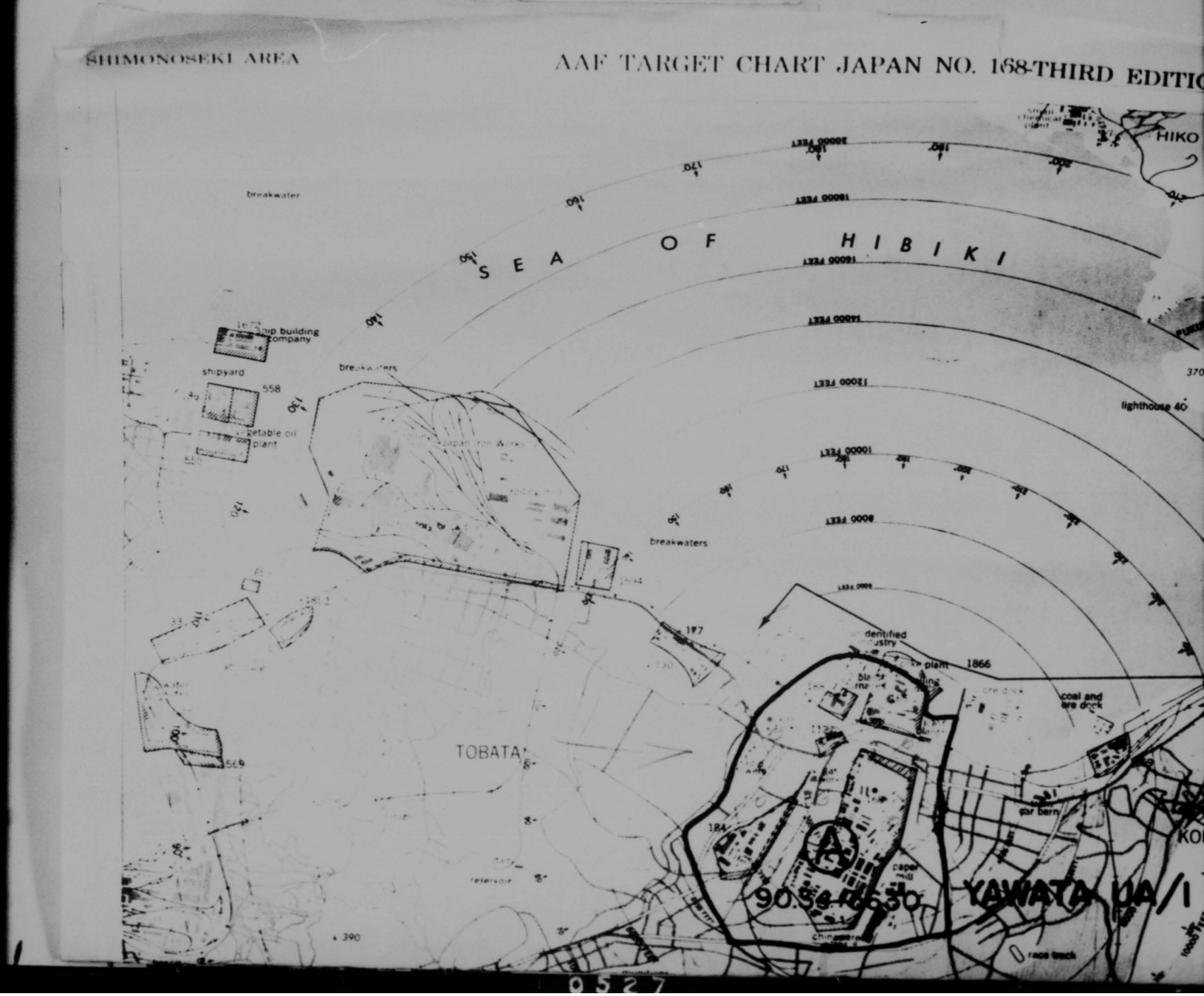
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TARGET NUMBER	TARGET DESIGNATION	TARGET ELEVATION
155	Kokura Arsenal	110'
29	Iscahi Iron Works, Tobata Plant (Imperial Iron and Steel Works)	10'
33	Tobata Port	10
165	Kokura Steel Works	15
177	Otake Soda Co	20'
184	Kokura Railroad Shops	20'
188	Kokura Steam Power Plant No 2	20'
555	Toa Steel Mfg Co	10'
558	Tohta Kiln	10'
567	Ajuti Glass Co	20'
569	Kokura Chemical Industry	30'
1127	Kokura Steam Power Plant No 1	15
1594	Tobata Steam Power Plant	10'
1672	Akamatsu Shipyard	10
1673	Tamachi Shipyard	10'
1674	Dairi Ro Yard	15
1848	Nitto Sodium Sulphate Co	15'
1852	Hitachi Machine Works, Tobata Plant	15
1853	Oriental Cast Mfg Co	15'
1857	Okuma Iron Works	25'

TARGET NUMBER	TARGET DESIGNATION	TARGET ELEVATION
1859	Tokyo Rope Mfg Co	15'
1861	Hitachi Machine Works Wakamatsu Plant	10'
1866	Kokura Harbor Installations	10'

TARGET LOCATIONS ON THIS CHART ARE CORRECT. THESE LOCATIONS SUPERSEDE THOSE SHOWN IN AIR OBJECTIVE FOLDER NO. 90-34 DATED JULY 12, 1944.

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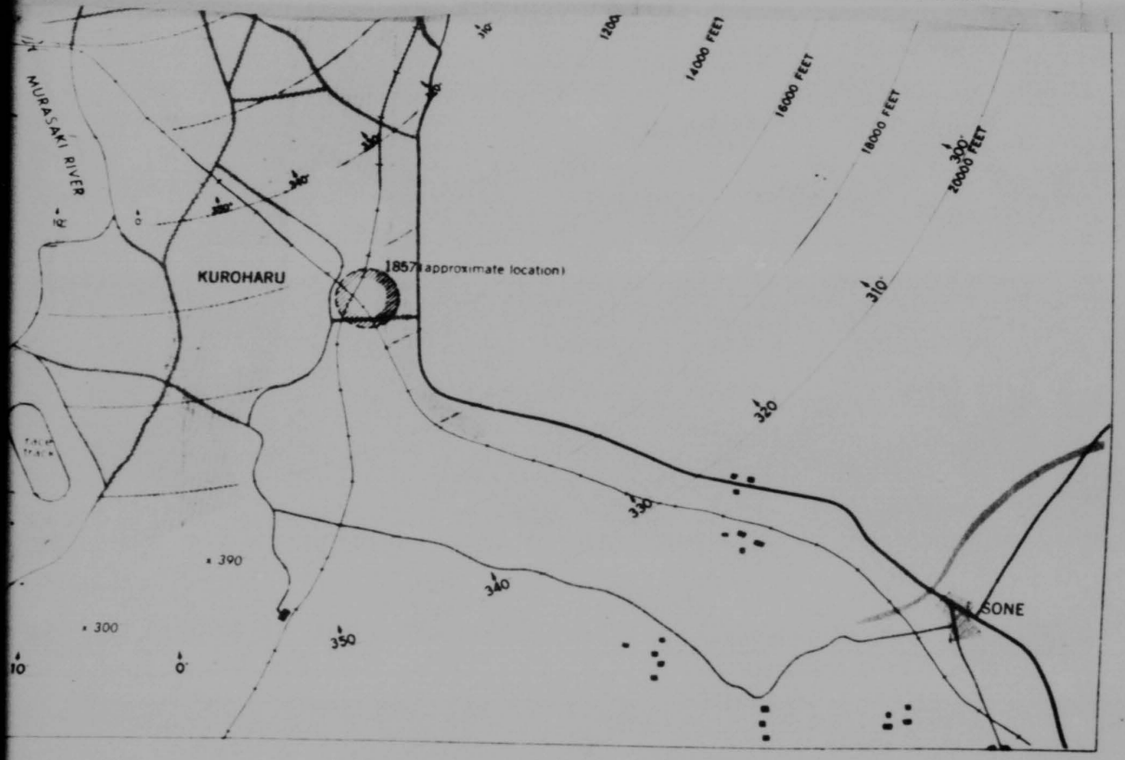
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LEGEND

- Primary Highways
- Secondary Highways
- Single Track Railroad
- Double Track Railroad
- Electric Railroad
- Power Lines

Elevations in Feet

110' Center Target Elevation

1440' Highest Known Elevation

Scale 1:36,000

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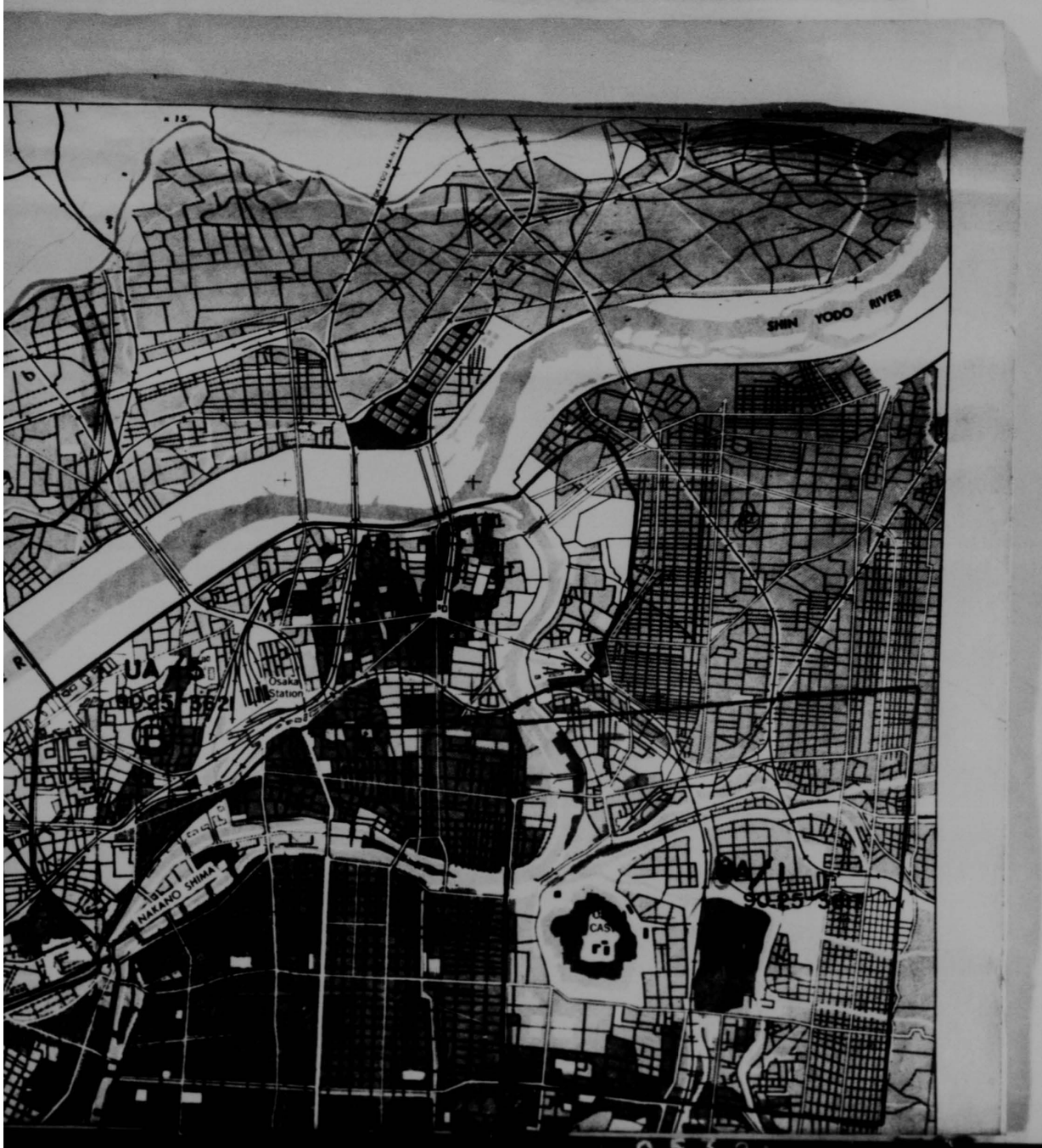


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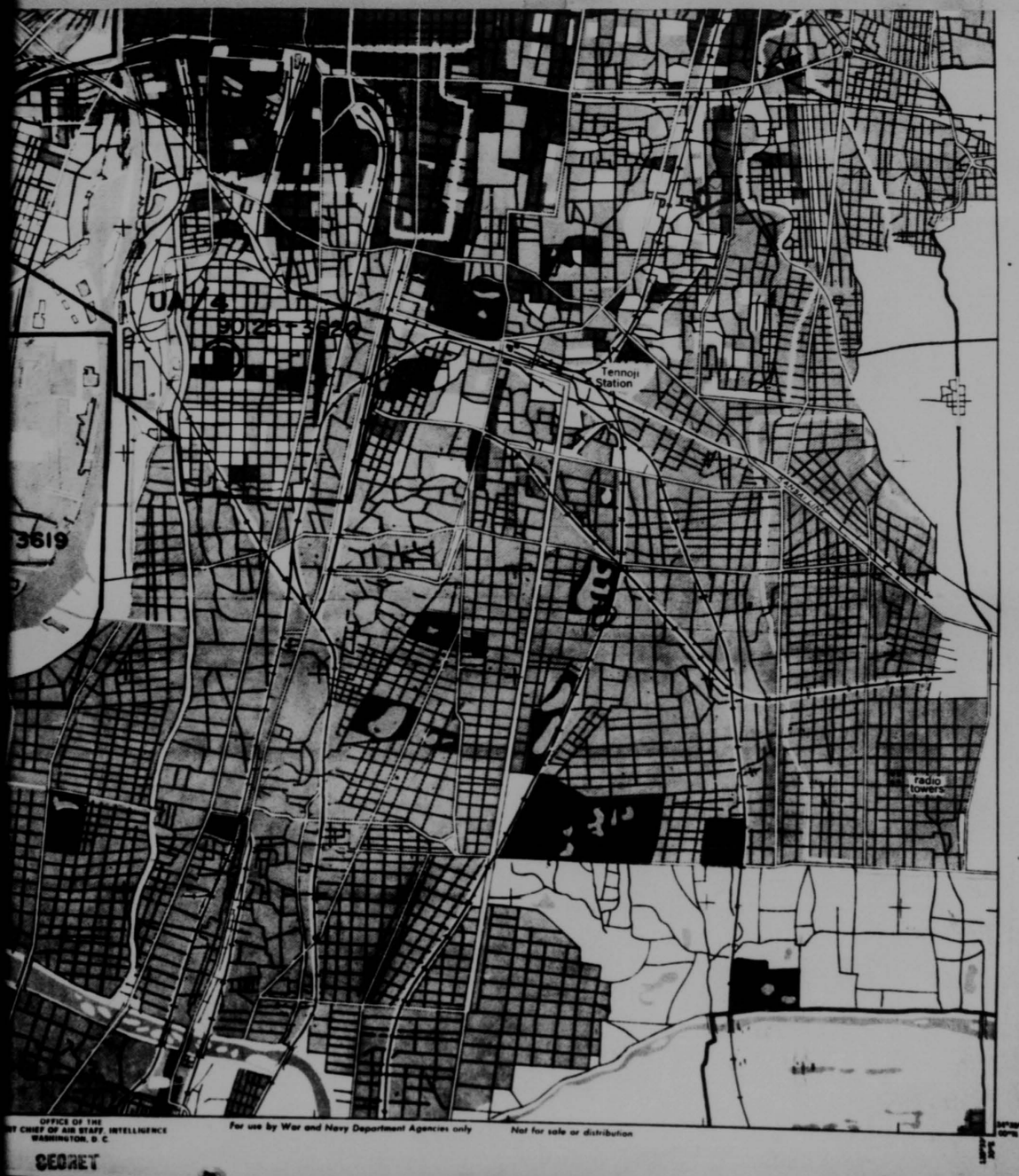


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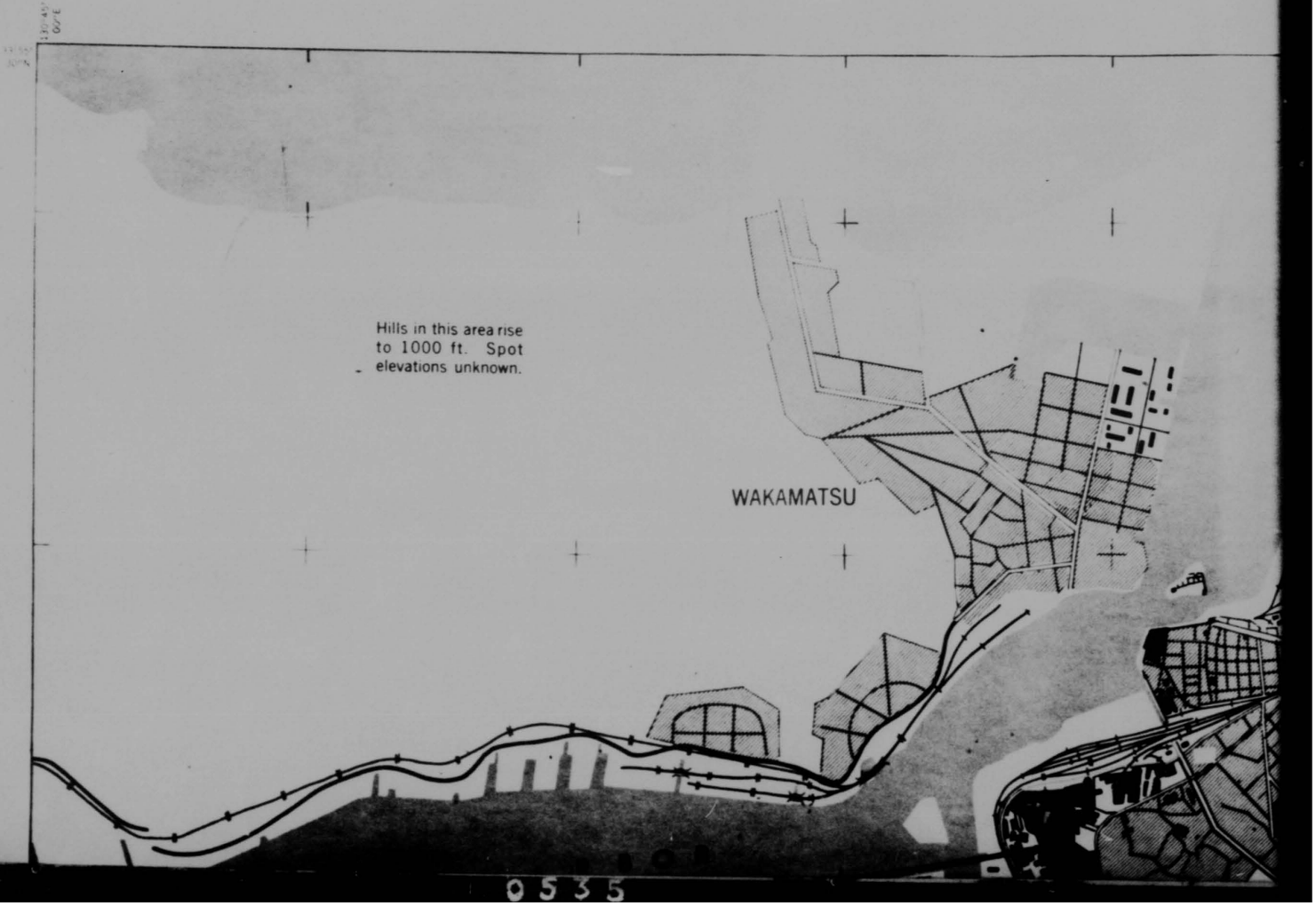


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YAWATA, JAPAN

~~INCENDIARY ZONE~~ MAP

~~ZONE I~~

~~ZONE II~~

STATUTE MILES

1/2 0 1 2

~~SCALE 1:25,000~~

SHIMONOSEKI STRAIT

TOBATA

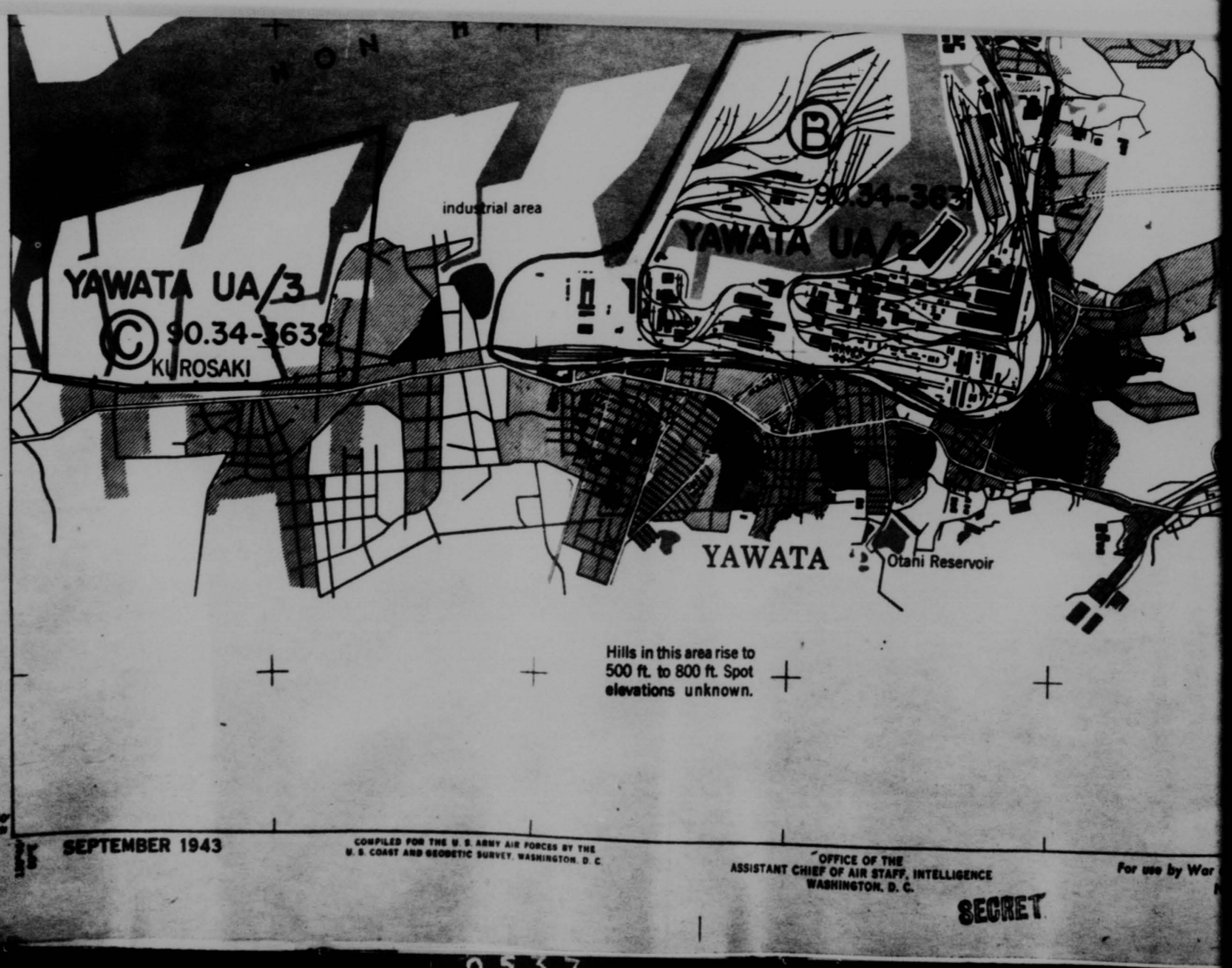
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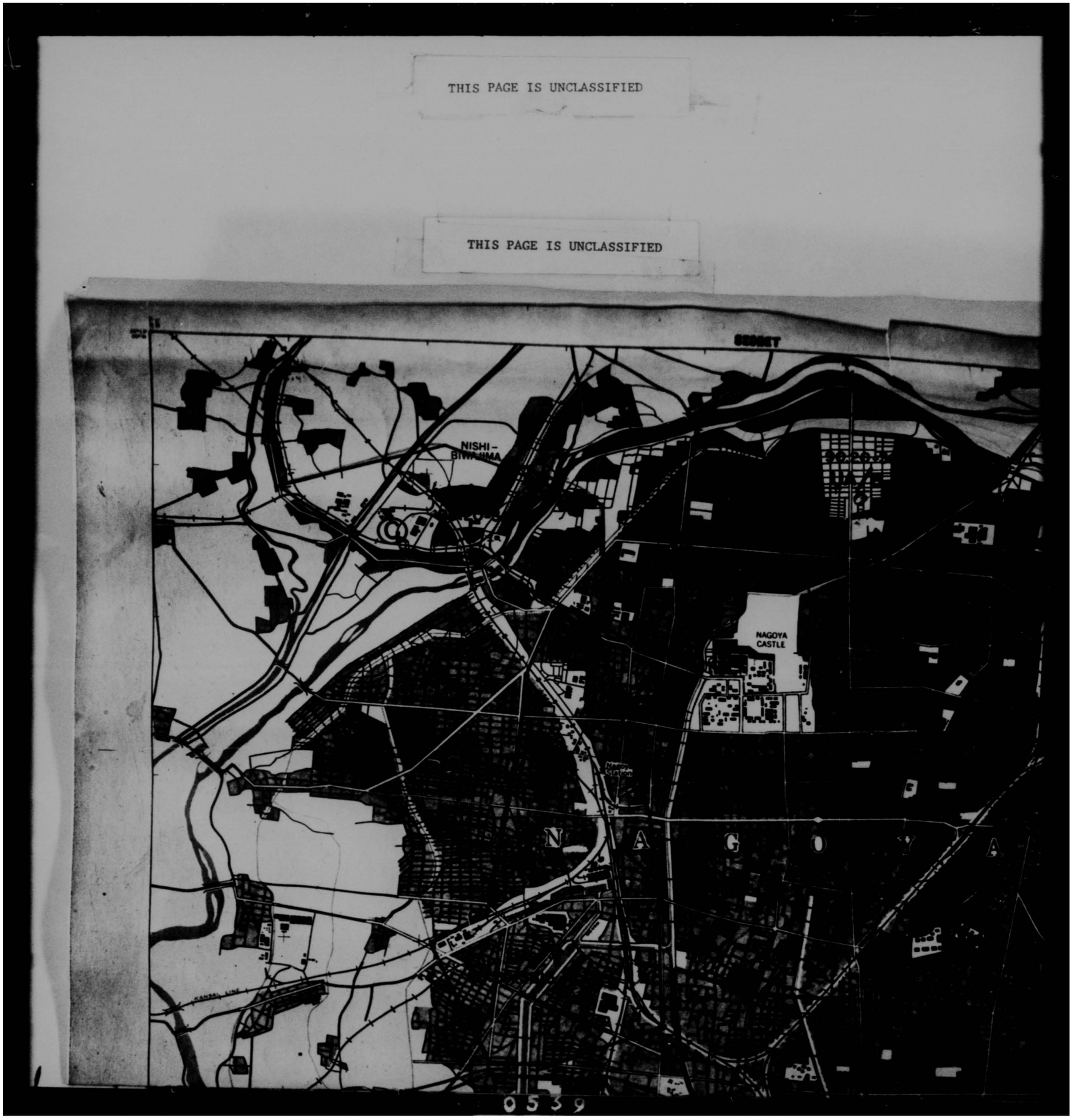


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[illegible] installations within approximately 4,000 ft. of the target and one or more objectives of primary significance (in addition to the center target), a number of other listed installations and many unidentified small shops, storehouses and miscellaneous industrial or transport facilities of some aggregate importance. With the exception of the clusters centered on Targets 194 and 1598, the selected target groups also include or adjoin dense concentrations of workers' homes.

Key unit of Mitsubishi Aircraft, Target 193 is part of a major industrial concentration in NE Nagoya which includes electrical equipment, ordnance, machinery and machine tools and a number of related small factories.

TARGET NO.	NAME
193	- Mitsubishi Aircraft Engine Works
254	- Mitsubishi Electric Mfg. Co. (Aircraft instruments, electrical equipment and machine tools)
196	- Origuma Factory of Nagoya Arsenal (Ordnance and instruments)
A41	- Okuma Iron Works (Machine Tools)

Not listed as targets, but located within approximately 4000 ft of Target 193 are the following installations:

Toyo Textile Co
Nagoya Ceramics Co
Nagoya Waterworks, Filtering and Pumping Plant

Main plant of the Nagoya Arsenal, Target 197 is the center of an important industrial concentration in central Nagoya which includes related ordnance, aircraft components, electrical equipment, and special steel plants.

TARGET NO.	NAME
197	- Atsuta Factory of Nagoya Arsenal
241	- Nippon Vehicle Co. (Ordnance, MR equipment)
242	- Okamoto Aircraft Works, Showa Plant (parts)
199	- Aichi Aircraft Works, Mizuho Plant (AA fire-control and aircraft instruments)
1171	- Nippon Insulator Co. (High-tension electrical equipment, sparkplugs etc)
1823	- Tokai Electrode Co.
247B	- Daido Electric Steel, Atsuta Plant
456	- Toho Gas Works and Synthetic Oil Plant

Not listed as targets, but located within approximately 4000 ft of Target 197 are the following installations:

Koa Textile Mill (converted to machinery mfg.)
Shibata Iron Works
Washino Machine Co.
Atsuta Power Plant (standby)
Onoda Cement Co.
Japan Glass Co.
Hattori Textile Mill
Toyo Textile Mill

Key plant of Aichi Aircraft, Target 198 is situated just SW of the principal industrial concentration in central Nagoya, in a district of ordnance plants, small machine shops and a reported major unit of the Sumitomo Light Metals Co.



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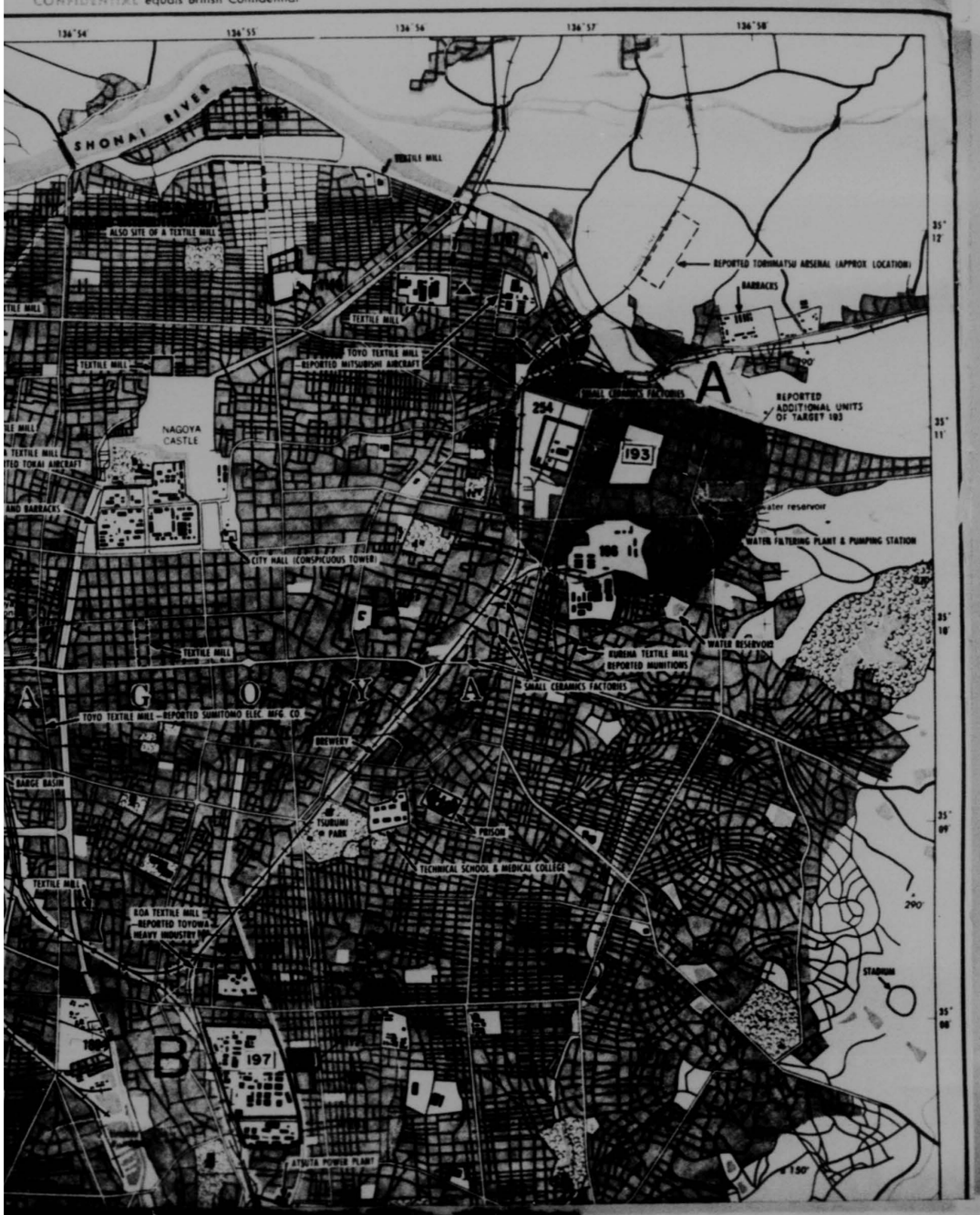
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198 - Aichi Aircraft Works, Atsuta Plant
1798 - Osaka Machinery Works

Not listed as targets on this map, but located within approximately 4000 ft of Target 198 are the following installations:

Sumitomo Light Metals (reported major production of dural and aircraft forgings)
Meiji Watch Co. (precision instruments)
Several Machine Gun and Light Ordnance Component Factories

C

Nagoya's largest power plant, Target 1598 adjoins the Kitoku assembly unit of Aichi Aircraft. Located nearby are an Aichi parts factory and several chemical plants.

TARGET No.	NAME
1598	Nagoya #2 Steam Power Plant
1729	Aichi Aircraft Works, Kitoku Plant
1828	Aichi Aircraft Works, Tsukiji Plant
253	Nissan Chemical Plant
251	Nagoya Harbor

Not listed as targets, but located within approximately 4000 ft of Target 1598 are the following installations:

Chuo Iron Works
Teikoku Oil Co (Storage)
Showa Chemical Co
Japan Chemical Fertilizer Co
Tokai Soda Co
Naka Canal Locks and Transshipment Facilities

D

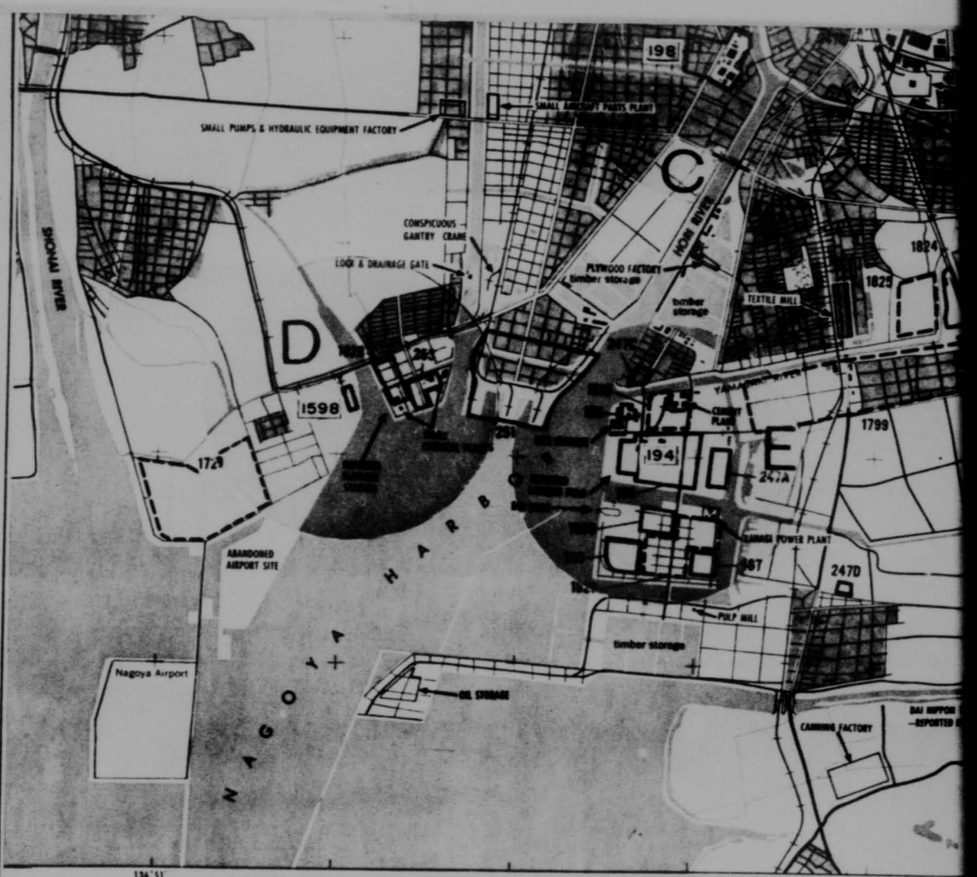
One of Japan's major aircraft works Target 194 is located on the highly industrialized Nagoya waterfront, surrounded by special steel, chemical and machinery plants, an important power station, harbor and ship repair facilities.

TARGET NO.	NAME
194	Mitsubishi Aircraft Works
1818	Tokushu Light Metals (Aircraft castings)
1799	Hokoku Machinery Co (Aircraft parts)
1800	Daido Machinery Co, Showa Plant
247A	Daido Electric Steel, Oe Plant
247C	Daido Electric Steel, Tsukiji Plant
1829	Yahagi Steel Plant
255	Yahagi Electro-Chemical Co.
467	Showa Soda Plant
195	Nagoya No. 1 Steam Power Plant
251	Nagoya Harbor

Not listed as targets, but located within approximately 4000 ft of Target 194 are the following installations:

Nagoya Dockyard
Yahagi Power Plant (standby)
Toyokuni Cement Works
Nagoya Box Co.
Government Rice Storage
Nisshin Flour Mill
Several Sawmills and Small Factories

E



NAGOYA

BUILT-UP DISTRICTS

DOUBLE-TRACK RAILROADS
SINGLE-TRACK RAILROADS
STREETS AND ROADS
▲ . . . MAIN POWER SUBSTATIONS

ELEVATIONS IN FEET

DATE OF ANALYSIS— MAY 1944

ADAPTED FROM JAPANESE IMPERIAL LAND SURVEY 1934, NAGOYA CITY PLAN 1941, AND CERTAIN OBLIQUE PHOTOGRAPHS

193	MITSUBISHI AIRCRAFT ENGINE WORKS	247D	DAIDO ELECTRIC STEEL, MINAMI
194	MITSUBISHI AIRCRAFT WORKS	250A	NAGOYA FREIGHT YARDS
195	NAGOYA #1 STEAM POWER PLANT	250B	NAGOYA REPAIR SHOPS
196	CHIGUSA FACTORY OF NAGOYA ARSENAL	250C	NAGOYA STATION
197	ATSUTA FACTORY OF NAGOYA ARSENAL	251	NAGOYA HARBOR
198	AICHI AIRCRAFT WKS, ATSUTA PLANT	253	NISSAN CHEMICAL PLANT
199	AICHI AIRCRAFT WKS, MIZUHO BRANCH	254	MITSUBISHI ELECTRIC MFG CO
241	NIPPON VEHICLE MFG CO	255	YAHAGI ELECTRO-CHEMICAL PLA
242	OKAMOTO AIRCRAFT WKS, SHOWA PLANT	430	TOYODA MACHINERY MFG CO
247A	DAIDO ELECTRIC STEEL, OE PLANT	456	TOHO GAS WORKS SYNTHETIC O
247B	DAIDO ELECTRIC STEEL, ATSUTA PLANT	461	OKUMA IRON WORKS, OZONE P
247C	DAIDO ELECTRIC STEEL, TSUKIJI PLANT	467	SHOWA SODA PLANT

TARGET INFORMATION SECTION
26 OCTOBER, 1944

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NOTE,
CIRCLES EXTEND APPROX 4000 FT
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NAGOYA
SELECTED TARGET CONC

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193	MITSUBISHI AIRCRAFT ENGINE WORKS	247D	DAIDO ELECTRIC STEEL, MINAMI PLANT	1129	OKAMOTO AIRCRAFT WKS, KASADERA PLANT	1799	HOKOKU MACHINERY CO, KASADERA PLANT
194	MITSUBISHI AIRCRAFT WORKS	250A	NAGOYA FREIGHT YARDS	1141	TOYOWA HEAVY INDUSTRY CO, SHINKAWA PLANT	1800	DAIDO MACHINERY PLANT, SHOWA PLANT
195	NAGOYA #1 STEAM POWER PLANT	250B	NAGOYA REPAIR SHOPS	1146	OKUMA IRON WORKS, HAGINO PLANT	1808	MEIDENSHA ELECTRIC MFG CO, NISHI BIWAJIMA PLANT
196	CHIGUSA FACTORY OF NAGOYA ARSENAL	250C	NAGOYA STATION	1147	OKUMA IRON WORKS, NUNOIKE PLANT	1809	HOKOKU MACHINERY CO, ATSUTA PLANT
197	ATSUTA FACTORY OF NAGOYA ARSENAL	251	NAGOYA HARBOR	1153	JAPAN PORCELAIN CO	1818	TOKUSHU LIGHT METALS CO, ATSUTA PLANT
198	AICHI AIRCRAFT WORKS, ATSUTA PLANT	253	NISSAN CHEMICAL PLANT	1171	NIPPON INSULATOR CO	1821	RIKEN ALUMITE PLANT
199	AICHI AIRCRAFT WKS, MIZUHO BRANCH	254	MITSUBISHI ELECTRIC MFG CO	1598	NAGOYA #2 STEAM POWER PLANT, MEIKO PLANT	1823	TOKAI ELECTRODE CO, NAGOYA #1 PLANT
241	NIPPON VEHICLE MFG CO	255	YANAGI ELECTRO-CHEMICAL PLANT	1729	AICHI AIRCRAFT WKS, EITOKU PLANT	1824	TOKAI ELECTRODE CO, NAGOYA #2 PLANT
242	OKAMOTO AIRCRAFT WKS, SHOWA PLANT	430	TOYODA MACHINERY MFG CO	1735	TOYOWA HEAVY INDUSTRY CO, NISHI PLANT	1825	TOKAI ELECTRODE CO, NAGOYA #3 PLANT
247A	DAIDO ELECTRIC STEEL, OE PLANT	456	TOHO GAS WORKS SYNTHETIC OIL PLANT	1753	KOBE STEEL WORKS, NAGOYA PLANT	1827	DAI NIPPON CELLOPHANE PLANT
247B	DAIDO ELECTRIC STEEL, ATSUTA PLANT	461	OKUMA IRON WORKS, OZONE PLANT	1797	OKUMA IRON WKS, KAMI HDA CHO PLANT	1828	AICHI AIRCRAFT WORKS, TSURUI PLANT
247C	DAIDO ELECTRIC STEEL, TSURUI PLANT	467	SHOWA SODA PLANT	1798	OSAKA MACHINERY WORKS	1829	YANAGI STEEL PLANT
						1831	HIRANO LOOM WORKS, NAKAGAWA PLANT

TRACK RAILROADS
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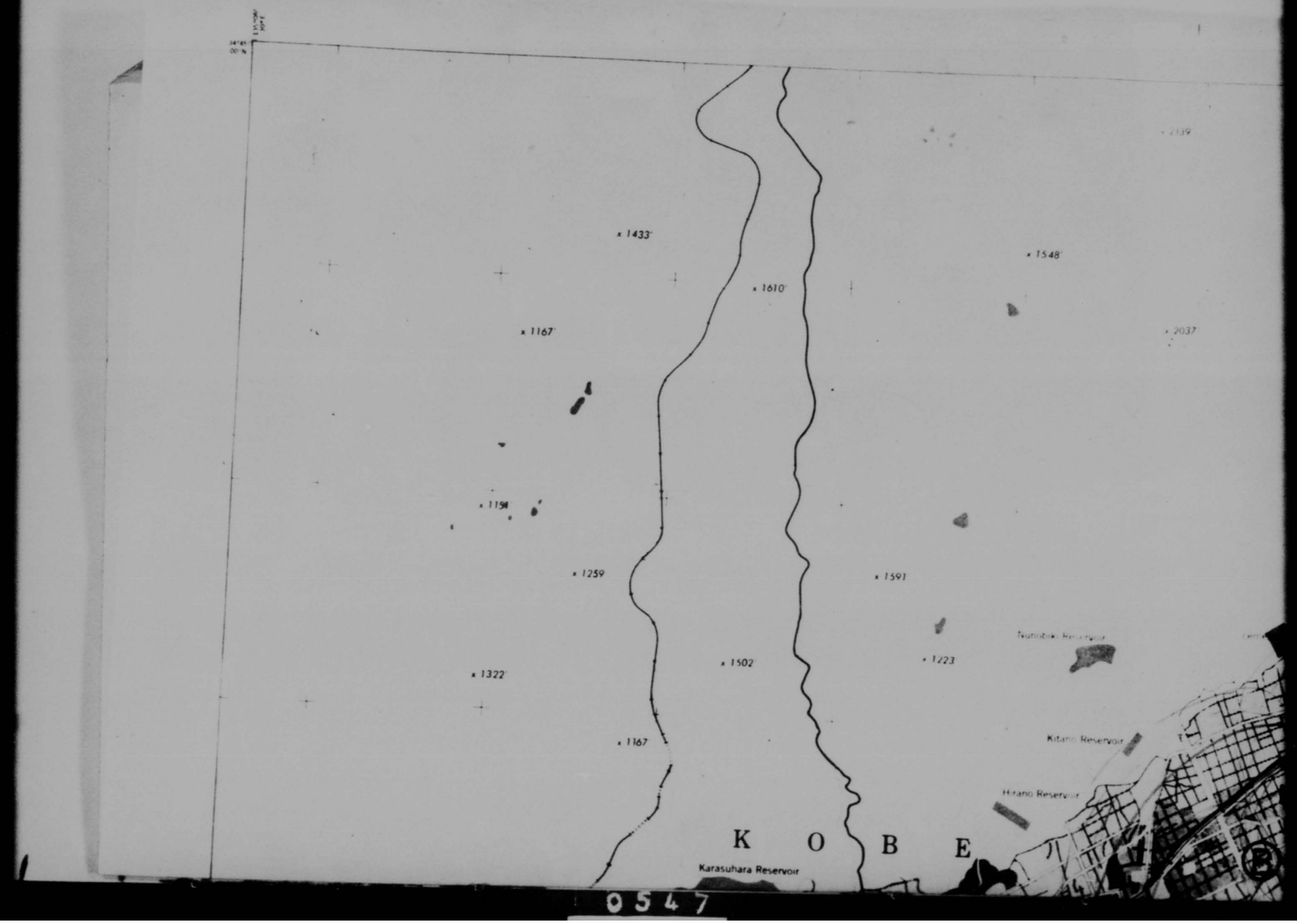
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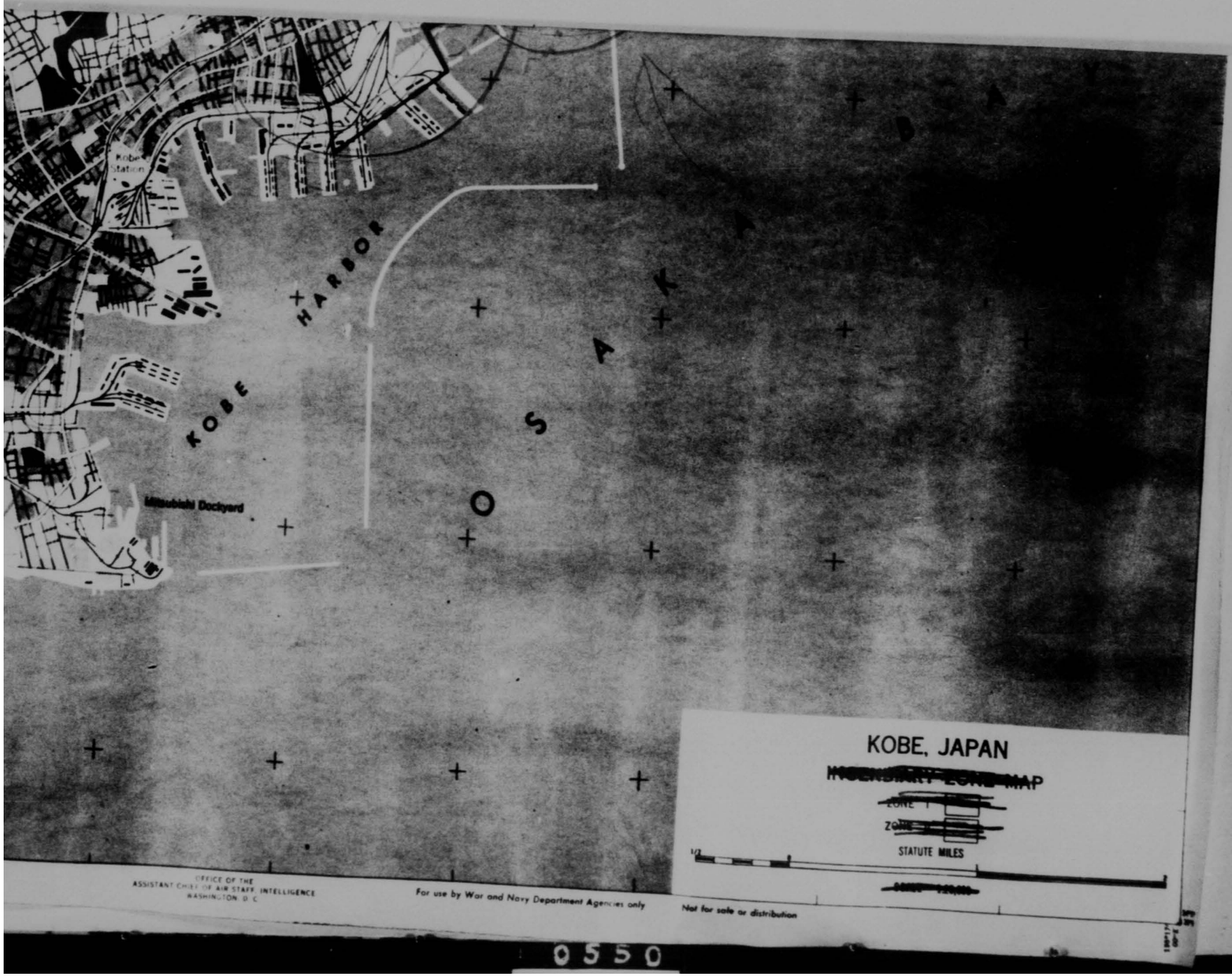
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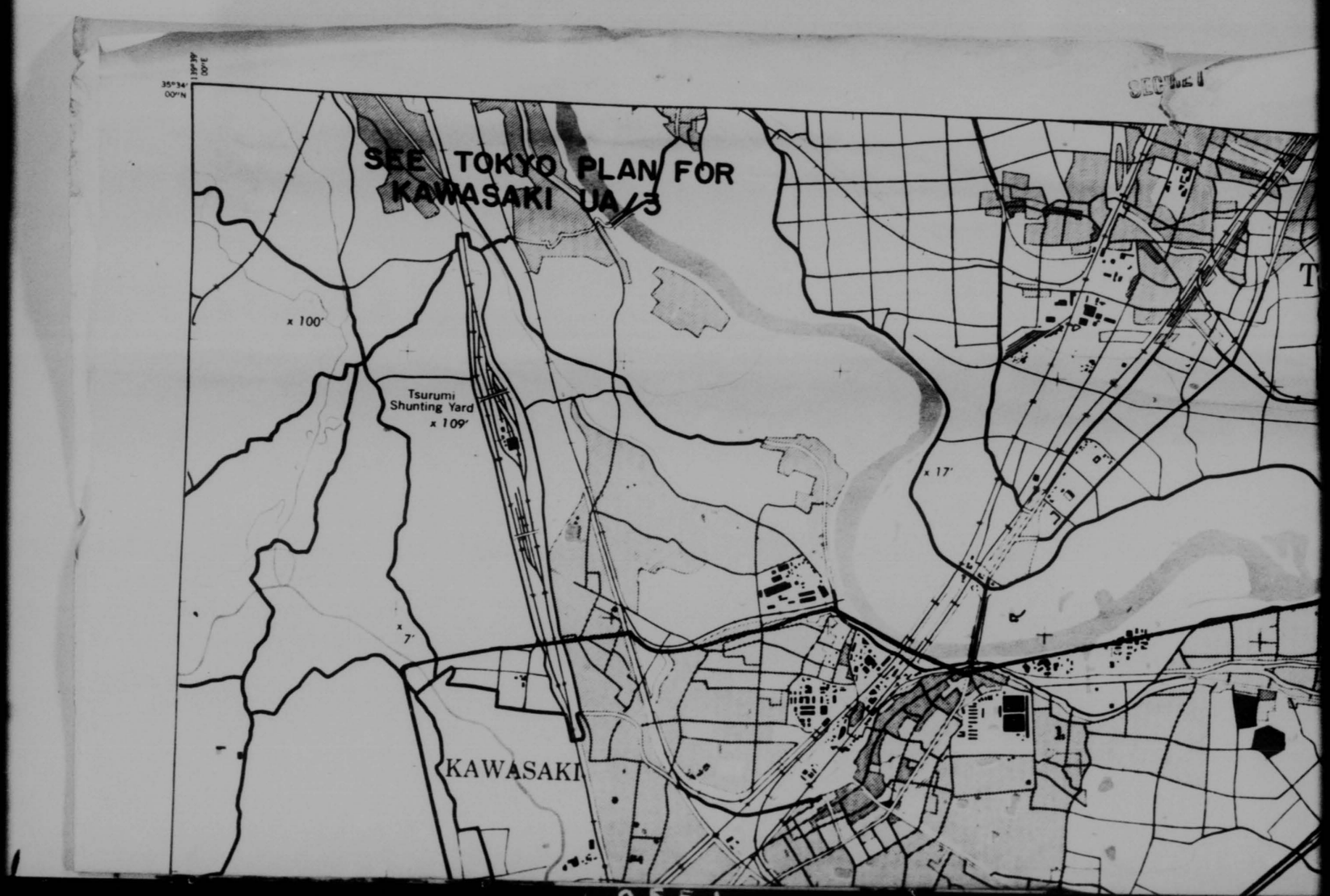


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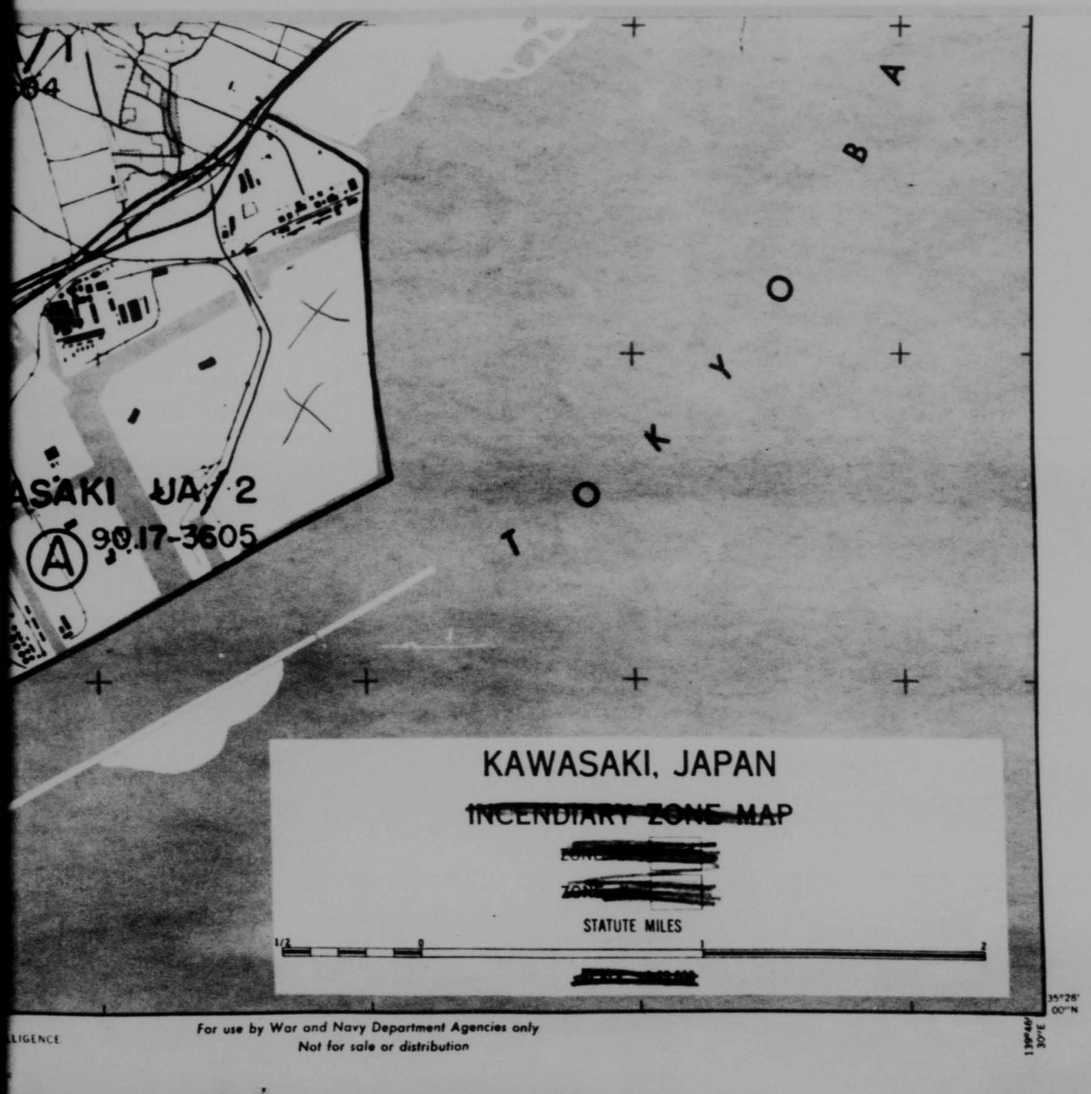


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Assistant Chief of Air Staff, Intelligence
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1. "Weather Conditions Affecting Incendiary Bombing of Japan" - Report #245 (Confidential) v. 2

2. "Weather Conditions Affecting the Bombing of Japan" - Report #463 (Secret) v. 3

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Assistant Chief of Air Staff, Intelligence
Washington, D. C.

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NO. 245

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PUBLICATIONS OF THE WEATHER INFORMATION SERVICE
HEADQUARTERS ARMY AIR FORCES

WEATHER CONDITIONS AFFECTING INCENDIARY BOMBING OF JAPAN

NO. 245

Prepared by the Statistics Division, U.S. Weather Bureau
under the direction of the Weather Information Service
Headquarters Army Air Forces
May 1943

C-675, AF

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LIST OF STATIONS

(English spellings have been used for the more familiar stations and will sometimes differ from the Japanese transliterations in the tables.)

Station	Latitude	Longitude	Page
Abashiri	44° 1' N.	144° 17' E.	38
Aikawa	38° 2	138 14	39
Akita	39 43	140 6	19, 38, 87
Aomori	40 50	140 45	38
Aparri	18 22	121 34	39
Asahigawa	43 47	142 22	38
Asio	36 39	139 27	39
Asizuri	32 44	133 1	39
Changchun	43 55	125 18	39
Che-Foo	37 34	121 30	39
Dairen	38 54	121 38	39
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Hamada	34 54	132 4	38
Hamamatsu	34 43	137 43	38
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Hikone	35 16	136 15	38
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Hukui	36 3	136 16	38
Hukuoka	33 35	130 25	38
Hukusima	37 45	140 24	38
Husan	35 6	129 1	39
Husiki	36 47	137 3	38
Ibukisan	35 25	136 24	39
Iida	35 31	137 50	39
Isigakizima	24 20	124 10	38
Isinomaki	38 26	141 19	38
Ituhara	34 12	129 17	38

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Station	Latitude	Longitude	Page
Kagoshima	31° 34' N.	130° 33' E.	38
Kanazawa	36 32	136 39	38
Karenko	23 58	121 36	38
Katuura	35 9	140 19	39
Keizyo	37 34	126 59	39
Kobe	34 41	135 11	23, 27, 28, 38
Kohu	35 38	138 34	38
Koryo	37 42	128 48	39
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Kumagaya	36 9	139 23	38
Kumamoto	32 49	130 42	38
Kushiro	42 59	144 24	39
Kyoto	35 1	135 44	38
Maebashi	36 24	139 4	38
Maoka	47 3	142 3	39
Matsumoto	36 14	137 59	39
Matsuyama	33 50	132 45	38
Mera	34 55	139 50	39
Midusawa	39 8	141 8	39
Minaduki	37 22	136 45	39
Mito	36 23	140 28	38
Miyadu	35 32	135 12	39
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Naha	26 13	127 41	38
Naze	28 23	129 30	38
Nemuro	43 20	145 35	38
Niigata	37 55	139 3	38
Niihama	33 58	133 16	38
Numadu	35 6	138 51	38
Obihiro	42 55	143 12	38

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Station	Latitude	Longitude	Page CONFIDENTIAL
Okayama	34° 40' N.	133° 54' E.	38
Onahama	36 56	140 54	39
Ooita	33 14	131 37	38
Ootomari	46 39	142 46	39
Osaka	34 39	135 26	23, 27, 28, 35, 43, 57-68, 126, 130, 131
Otiai	47 20	142 27	39
Ryojun	38 47	121 16	39
Ryuganpo	39 56	124 22	39
Saga	33 12	130 18	38
Sakai	35 33	133 14	38
Sapporo	43 4	141 21	38
Shanghai	31 15	121 30	39
Sikka	49 14	143 7	39
Shimonoseki	33 57	130 56	38
Siomisaki	33 27	135 46	39
Sisakazima	34 6	133 11	38
Sumoto	34 21	134 53	38
Suttu	42 48	140 13	38
Syana	45 14	147 53	39
Tadotu	34 17	133 46	38
Taihoku	25 2	121 31	38
Taikyu	35 52	128 35	39
Tainan	23 0	120 13	38
Taito	22 45	121 9	38
Taityu	24 9	120 41	38
Takada	37 6	138 15	39
Takayama	36 9	137 15	39
Tateno	36 3	140 8	39
Titizima	27 5	142 11	39
Tokushima	34 4	134 33	38
Tokyo	35 41	139 46	23, 25, 27, 28, 35, 42, 45-56, 86, 126, 128, 129
Toyooka	35 32	134 49	39
Tsingtao	36 4	120 19	39
Tu	34 44	136 31	38
Tukubasan	36 13	140 6	39
Turuga	35 38	136 3	39

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Station	Latitude	Longitude	Page
Tyosi	35° 44' N.	140° 51' E.	38
Tyukotin	41 47	126 53	39
Utsonomiya	36 34	139 53	38
Vladivostok	43 7	131 55	39
Wakayama	34 14	135 9	38
Yagi	34 31	135 48	38
Yamagata	38 15	140 21	38
Yingkow	40 40	122 14	39
Yokohama	35 27	139 39	23, 38
Yuki	42 20	130 24	39
Zenshu	35 49	127 9	39
Zinsen	37 29	126 37	39
Zyosin	40 40	129 11	39

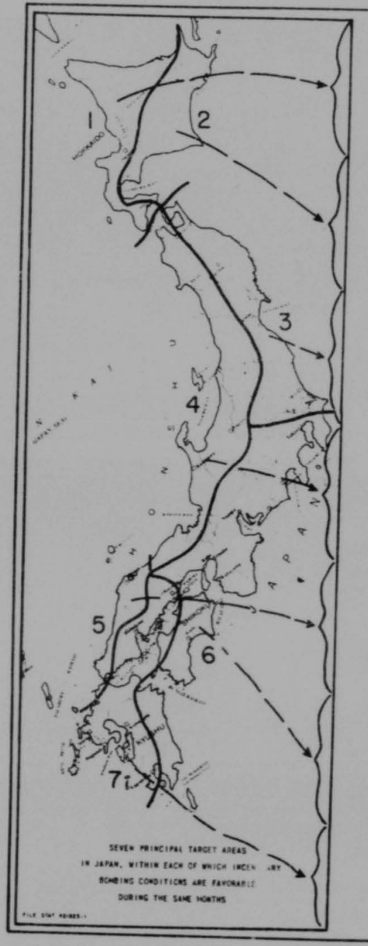
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U. S. DEPT. OF COMMERCE



RECOMMENDATIONS

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	C
CONDITIONS FOR INCENDIARY RAIDS:	Poor	Fair	Fair	Fair	Good	Fair	
RANK OF MONTH:	12	7	8	6	2	5	
MAKE DAYLIGHT RAIDS AT:	1300	1315	1330	1400	1400	1415	1
MAKE NIGHT RAIDS AT:	1845	1930	2015	2100	2100	2215	2
UNDER SYNOPTIC CONDITIONS TYPE:	II	II	I,II	I,II	I	I	

CONDITIONS FOR INCENDIARY RAIDS:	Fair	Fair	Fair	Fair	Good	Fair	F
RANK OF MONTH:	7	5	6	4	1	3	
MAKE DAYLIGHT RAIDS AT:	1330	1345	1345	1400	1415	1430	1
MAKE NIGHT RAIDS AT:	1845	1930	1930	2100	2200	2215	2
UNDER SYNOPTIC CONDITIONS TYPE:	II	II	II	I,II	I	I	

CONDITIONS FOR INCENDIARY RAIDS:	Fair	Fair	Fair	Fair	Poor	Poor	F
RANK OF MONTH:	4	6	5	3	7	8	
MAKE DAYLIGHT RAIDS AT:	1300	1400	1500	1430	1500	1500	1
MAKE NIGHT RAIDS AT:	1900	1930	2000	2030	2115	2120	2
UNDER SYNOPTIC CONDITIONS TYPE:	II	II	II	0,II	I	I	

CONDITIONS FOR INCENDIARY RAIDS:	Poor	Poor	Poor	Fair	Good	Good	P
RANK OF MONTH:	7	6	8	3	1	2	
MAKE DAYLIGHT RAIDS AT:	1400	1400	1430	1445	1445	1430	1
MAKE NIGHT RAIDS AT:	1845	1915	2000	2045	2115	2130	2
UNDER SYNOPTIC CONDITIONS TYPE:	II	II	I,II	I,II	I	I	

PLAN FOR MAXIMUM INCENDIARY LOADS IN GOOD AND EXCELLENT MONTHS, NE

CONDITIONS FOR INCENDIARY RAIDS:	Poor	Poor	Fair	Poor	Poor	Poor	P
RANK OF MONTH:	5	6	2	3	4	12	
MAKE DAYLIGHT RAIDS AT:	1400	1400	1400	1300	1400	1220	1
MAKE NIGHT RAIDS AT:	1900	1915	1945	2015	2045	2100	2
UNDER SYNOPTIC CONDITIONS TYPE:	I,II	I,II	I,II	I,II	I	I	

CONDITIONS FOR INCENDIARY RAIDS:	Good	Fair	Good	Good	Fair	Poor	P
RANK OF MONTH:	5	8	2	3	7	12	
MAKE DAYLIGHT RAIDS AT:	1300	1330	1400	1400	1400	1400	1
MAKE NIGHT RAIDS AT:	1900	1915	1945	2030	2115	2115	2
UNDER SYNOPTIC CONDITIONS TYPE:	II	II	I,II	I,II	I	I	

CONDITIONS FOR INCENDIARY RAIDS:	Fair	Fair	Fair	Poor	Poor	Poor	F
RANK OF MONTH :	3	4	2	5	9	12	
MAKE DAYLIGHT RAIDS AT:	1400	1400	1400	1300	1330	1300	1
MAKE NIGHT RAIDS AT:	1900	1915	1945	2015	2045	2100	2
UNDER SYNOPTIC CONDITIONS TYPE:	I,II	I,II	I,II	I,II	I	I	

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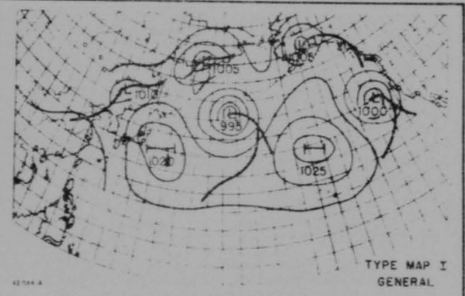
ABSTRACT

INCENDIARY BOMBING OF JAPAN

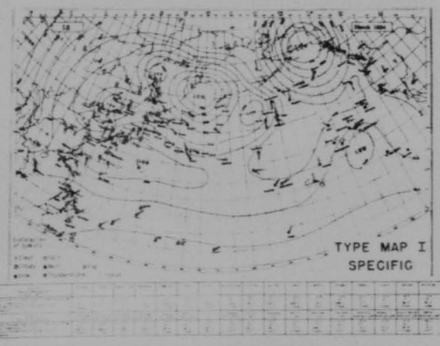
JULY Good	AUG. Good	SEPT. Poor	OCT. Good	NOV. Poor	DEC. Poor	COMMENTS
1	4	10	3	9	11	Icing conditions, particularly at low
415	1400	1345	1400	1345	1330	levels, October through April. Icing
215	2130	2030	1930	1830	1815	apt to be severe November through February
I	I	I,II	I,II	II	II	
oor	Poor	Poor	Good	Poor	Poor	Icing conditions October through April.
10	11	12	2	8	9	Severe icing, November through February.
500	1430	1415	1400	1330	1300	High altitude bombing on clear, cold days
200	2130	2100	1930	1830	1815	feasible during winter without danger of
I	I	I,II	I,II	II	II	severe icing.
oor	Poor	Poor	Poor	Fair	Fair	Icing conditions October through April.
9	11	12	10	1	2	Clear days, without severe icing at upper
430	1400	1430	1430	1300	1400	levels, are however frequent in winter.
130	2100	2015	1915	1830	1815	Under such circumstances approach target
I	I	I	I,II	II	II	area at altitudes above 15,000 feet to
						avoid more severe icing along the west
						coast and over the mountains.
oor	Poor	Poor	Poor	Fair	Fair	Icing conditions October through April.
10	9	12	11	5	4	Icing particularly severe at levels below
430	1400	1345	1345	1330	1330	8,000 feet. Overcast with low ceilings
130	2100	2015	1915	1830	1815	particularly frequent during winter.
1	I	I,II	I,II	II	II	

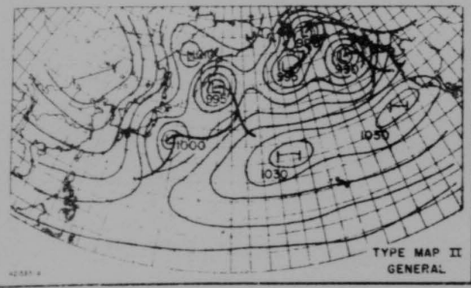
AR-MAXIMUM LOADS IN FAIR MONTHS, LOW INCENDIARY LOADS IN POOR MONTHS.

oor	Poor	Poor	Poor	Poor	Fair	
11	9	10	8	7	2	Icing conditions October through March.
500	1230	1400	1400	1230	1200	Icing particularly severe below 8,000
100	2045	2000	1915	1830	1830	feet. Cold, clear, windy days are par-
I	I	I,II	I,II	I,II	I,II	ticularly rare in this area and when they
						occur should be utilized for incendiary
						raids.
oor	Good	Fair	Fair	Good	Excel-lent	November thru March raids on Tokyo-Nagoya
11	4	10	9	6	1	Osaka-Kobe area should be made with low
400	1430	1500	1430	1200	1230	overcast and low icing conditions along
115	2100	2000	1915	1830	1830	west coast, simultaneously clear over
1	I	I,II	I,II	I,II	II	target on east coast, planes coming in
						above 15,000 feet and returning west
						across top of overcast.
oor	Poor	Poor	Fair	Poor	Poor	Icing along west coast October through
10	8	11	1	7	6	March. Wind velocities generally low
430	1200	1200	1300	1230	1130	in this area, therefore when high velo-
100	2045	2000	1915	1830	1830	cities occur without accompanying precipi-
I	I	I	I,II	I,II	I,II	tation seize opportunity to make incendiary
						raids.



TYPE MAP I
GENERAL


TYPE MAP I
SPECIFIC



TYPE MAP II
GENERAL

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WEATHER CONDITIONS AFFECTING THE INCENDIARY BOMBING OF JAPAN

INTRODUCTION: HOW TO USE THIS REPORT

This report, *Weather Conditions Affecting the Incendiary Bombing of Japan*, is divided into six principal parts:

1. The Abstract, which contains ratings of the months and recommendations for bombing of each target area (page xi).
2. A discussion of the weather factors affecting incendiary bombing (page 2).
3. A discussion of the methods used for rating the weather of each month as to suitability for incendiary bombing (pages 3-6).
4. Brief discussions, giving the salient weather features of each month, as related to incendiary bombing of each target area in Japan (pages 7-34).
5. A brief discussion of weather conditions affecting the incendiary bombing of Tokyo, Osaka, and Nagasaki (pages 35-36).
6. Detailed information contained in tables, charts, and maps, found in the Appendices and in the text.

For information on a specific target, Tokyo, for example, one should first locate the city in the List of Stations (pages vii - x) and refer to the pages listed there, and second, look at the target area map (Appendix fig. 2), see in what target area the city is located, and consult the part of the section, Incendiary Bombing of Japan, which discusses that specific target area.

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WEATHER FACTORS IN INCENDIARY BOMBING

IGNITION

The igniting of buildings by incendiary bombs is virtually independent of weather conditions. A thick snow cover over buildings would reduce only slightly the percentage of ignition, since the majority of magnesium or oil-type bombs would penetrate the snow; the exact percentage would depend principally on the angle of incidence at which the bomb hit the surface.

SPREAD OF FIRE

Since ignition will occur under nearly all weather conditions, the weather factor is of importance chiefly because of its effect on the rate of spread of fire. This rate will depend on the distance to which sparks and embers are carried by the wind and their action in causing secondary ignition. The rate of spread, therefore, will depend on the wind velocity and the dryness of the secondary surfaces.

Of these two factors--wind velocity and surface dryness--the former is by far the more important. The rate of spread of fire is almost directly proportional to wind velocity. This linear proportion is only slightly modified by the degree of dryness of the surface, unless there is a snow cover or heavy precipitation has saturated the surface. In this connection, it should be noted that during the Tokyo fire of 1923, .19 of an inch of precipitation fell during the first day of the fire, but in spite of this, the rate of spread was very high.

The factor of surface dryness is dependent upon the length of time which has elapsed since the last rain and upon conditions of cloudiness, sunshine, wind velocity, and relative humidity, as they affect evaporation. This listing does not include consideration of the presence of snow cover, which is a special problem and is treated separately (Appendix figs. 10 and 11 and the section, Incendiary Bombing of Japan pages 8-34).

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RATING CONDITIONS REGARDING USE OF INCENDIARIES

Bearing in mind the concepts discussed in the preceding section, it becomes possible to develop sound methods for rating weather conditions by months in respect to their effect on the spread of fire. Two methods of rating were devised in this study. One specific method was developed to be applied to particular urban areas. The great amount of work necessary for the application of this method made it possible to apply it to only three specific stations, Tokyo, Osaka, and Nagasaki. The results obtained through the application of this method are shown in the section specifically devoted to these three cities (pages 35-36). These results were also used as a guide in rating conditions by target areas, using a more general scheme. Both the specific and general rating schemes are discussed in the following paragraphs.

SPECIFIC RATING SCHEME

The specific rating scheme was worked out with the aid of Dr. George M. Jemison, Silviculturist, Appalachian Forest Experiment Station, United States Department of Agriculture. Considerable study went into the preparation of this rating scheme. Particular attention was paid to the changes, under varying weather conditions, in the moisture content of wood within and on the outside of buildings: to weather conditions preceding and during the Tokyo fire of 1923, the Chicago fire of 1871, and the San Francisco fire of 1906.

It was found that the factor of surface dryness can be estimated on the basis of two variables: first, the number of days since the last appreciable amount of rain, and second, the sky conditions since that rain. On the basis of knowledge of the moisture content of wood, studies made in the United States, and general experience in fire problems, it was decided to use .15 of an inch (approximately 5 millimeters) as constituting an appreciable amount of rain. Sky conditions were classified as mostly clear or mostly cloudy.

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Wind velocity at the time of a raid is extremely important, as it greatly affects the spread of fire. Accordingly, this factor was given the greatest weight, and five categories of wind velocity were recognized. The result was the development of the rating chart shown in table 1. In this chart conditions are designated as 1, 2, 3, 4, 5, and 5+, corresponding to "bad," "poor," "neutral," "good," "excellent," and "superior" conditions. While the rating chart is empirical, it was developed on the basis of the experience gained through the development of similar tables which have been planned and successfully used in rating forest fire weather. In this report, however, *urban* conditions were taken into account through reference to data on urban fires and moisture content variations in urban buildings.

This rating chart (table 1) has two uses: first, it can be used to estimate the extent to which conditions are favorable for incendiary bombing of any particular target at any time, if there are records of the general weather conditions for several preceding days; and second, it can be used to estimate the frequency of "good," "excellent," and "superior" conditions for different targets, through determining the frequency of these conditions from past climatic data.

GENERAL RATING SCHEME

In the Abstract appearing on page xi and on the target area map (Appendix fig. 2), months are rated as being "excellent," "good," "fair," or "poor." Each month is also *ranked* with a number from 1 to 12, according to its relative suitability for incendiary bombing. The best hours for daylight and night raids are also given in the Abstract and in the discussion of bombing conditions by target areas.

The scale shown in table 2 was applied in rating the months as to their suitability for incendiary bombing of Japan.

In *ranking* the months, from 1 to 12, particular attention was paid to icing conditions, ceilings, and visibilities, in addition to the factors considered in the *ratings*. The process of ranking did not follow an empirical scale, but was based only on careful judgment. Wherever possible, it included the consideration of the results obtained for Tokyo, Osaka, and Nagasaki (Appendix tables 6, 7, and 8), through using the special rating scale in table 1.

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Table 1. - Scale for Rating Burning Conditions in Urban Communities

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at Time of Raid				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
				Class *		
1	Mostly Cloudy	1	1	1	2	2
	Mostly Clear	1	2	3	4	5
2 to 4	Mostly Cloudy	1	2	3	3	4
	Mostly Clear	2	3	4	5	5+
5 or more	Mostly Cloudy	2	3	4	5	5+
	Mostly Clear	3	4	5	5+	5+

*Class 1 Bad Conditions
Class 2 Poor Conditions
Class 3 Neutral Conditions
Class 4 Good Conditions
Class 5 Excellent Conditions
Class 5+ Superior Conditions

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Table.2. - Scale for Determining Relative Suitability of Months for Incendiary Bombing of Japan

Rating	Mean Wind Velocity	Snow	Mean Precipitation	Mean No. Clear Days	Mean Relative Humidity (%)
Excellent	Up to 11 m.p.h.	None	Under 3 in.	6 or more	Under 85
Good	Up to 11 m.p.h.	No deep snow	Under 5 in.	4 or more	Under 90
Fair (1)	Up to 11 m.p.h.	None	Under 5 in.	2 or more	----
(2)	Up to 11 m.p.h.	None	Over 5 in.	4 or more	----
(3)	Up to 11 m.p.h.	Deep	Under 3 in.	4 or more	----
(4)	Up to 9 m.p.h.	None	Under 5 in.	4 or more	Under 90
(5)	Under 9 m.p.h.	None	Under 3 in.	6 or more	Under 85

Poor (This represents all other conditions, usually referring to:
1. Under 9 m.p.h. with over 3 in. precipitation, or
2. Deep snow on ground with over 3 in. precipitation)

The selection of the best hours for daylight and night raids was based on diurnal wind velocity curves. The time selected was that immediately preceding the time of mean maximum wind velocity. In the case of night raids, this time was coincident with the time of total darkness, since, on the average, wind velocities decrease throughout the night.

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INCENDIARY BOMBING OF JAPAN

DATA

Pertinent data for Japan are given in tables 1 and 2, Appendix tables 1 through 8, and Appendix figures 1 through 59. These include a map showing locations of stations (Appendix fig. 1); type precipitation graphs (Appendix figs. 3 through 9); maps showing mean times of beginning and ending of snowfall (Appendix figs. 10 and 11); relative humidity maps by months (Appendix figs. 12 through 23); hours of sunshine by months (Appendix figs. 24 through 35); number of clear days by months (Appendix figs. 36 through 47); rating graphs for Tokyo, Osaka, and Nagasaki (Appendix figs. 48 through 51), as well as tables giving monthly ratings for these cities (Appendix tables 6 through 8), based on 5-year averages; graphs showing diurnal wind variations (Appendix figs. 52 through 57); and type synoptic charts (Appendix figs. 58 and 59). All of these data were consulted in preparing the following synopsis of weather conditions by months for each principal target area in Japan.

RATING GRAPHS

In utilizing the rating graphs for Tokyo, Osaka, and Nagasaki (Appendix figure 48 through 50), the graph for Nagasaki, which shows how these conditions tend to group, should also be consulted (Appendix fig. 51). There is a tendency for good days to follow good days, so that the mean frequency figures shown in the rating graphs must be examined in terms of this persistence factor. When utilizing these graphs, some allowance should be made, especially at Tokyo, for the fact that snow on the ground was not considered as a factor. Hence the winter data (December through February) show frequencies for "good" or better conditions which are somewhat higher than would be the case if snow cover were taken into account.

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TARGET AREAS

In discussing weather conditions as they pertain to incendiary bombing, it is convenient to recognize seven different target areas in Japan (Appendix fig. 2). Within each of these areas, conditions are favorable during the same months. The areas were identified on the basis of wind velocity variations throughout the year, duration of snow, and the variation in dryness of the surfaces of buildings, as related to frequency of appreciable amounts of precipitation. Consideration was also given to the influence of the factors of relative humidity, sunshine, number of clear days, and wind, on the rate of drying. In addition, considerable weight was given to the frequency of occurrence in different months of "good," "excellent," and "superior" conditions, as calculated on the basis of the rating chart in table 1. These latter data, however, were available in only two of the seven areas.

In the following sections the target areas are considered in order, from one to seven. For each there is a brief general discussion of incendiary bombing conditions throughout the year, followed by a resume of conditions month by month. Each month is ranked as to suitability for incendiary bombing, the most favorable month receiving the rank of 1, the least favorable, 12. Each month is also evaluated on an absolute scale, conditions being rated as "excellent," "good," "fair," or "poor." In some of the areas the best month may be only "fair;" in others, "excellent." Appendix table 3 gives a resume of the ratings and ranks by target areas.

Target Area 1

Conditions range from "poor" to "good," "poor" conditions being associated with deep snow on the ground and high snowfall, during November, December, and January, and with high precipitation in September. Best months are July May, October, and August, in the order given. All are rated good. Wind velocities are generally high throughout the area at all times of the year, and precipitation is lower than in any of the other target areas. The months with highest precipitation are September through January. From late fall to early spring, icing conditions are common at low levels, but on many days it should be possible to fly over the area at high levels with only broken cumulus underneath and to make incendiary raids at these levels.

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January. -- Rank: 12

Rating: Poor

Although wind velocities are high during this month (Appendix table 2), buildings will be covered with a thick layer of snow, which will tend to decrease the effectiveness of incendiary bombing. If raids are made, they should be made under Type II conditions (Appendix fig. 59).
Best hours: 1300 during daylight; 1845 at night.

February. -- Rank: 7

Rating: Fair

Snow still persists and will decrease effectiveness of incendiary raids. Wind velocities vary from 4 to 13 m.p.h. on the average. If raids are made, Type II conditions should be utilized (Appendix fig. 59). Icing will usually be prevalent at the surface.
Best hours for raids: about 1315 during daylight; 1930 at night.

March. -- Rank: 8

Rating: Fair

Snow cover, a high frequency of overcast, and frequent icing make incendiary raids impractical. If raids are made, use Type I or Type II conditions (Appendix figs. 58 and 59).
Best hours: about 1330 during daylight; 2015 at night.

April. -- Rank: 6

Rating: Fair

Snow cover ordinarily persists during this month, although in the last days of the month it may disappear in the southern part of the area along the coast. Wind velocities are favorable for raids, averaging 7 to 13 m.p.h. After snow has disappeared, drying will be quite rapid, so that if only light snows have occurred, the latter part of the month will be favorable for incendiary raids. Icing conditions decrease in frequency as the month progresses. Type II conditions should occur occasionally, with Type I conditions decreasing in frequency (Appendix figs. 58 and 59). Either may be used.
If a large incendiary bomb load is carried, the optimum time for raids will be: about 1400 during daylight; 2100 at night.

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May. -- Rank: 2

Rating: Good

This month is apt to be particularly favorable in the southern part of the coastal area during the latter part of the month. Snow cover may persist in the northern portions and in the highlands until the end of the month. Wind velocities average 7 to 13 m.p.h. Drying is quite rapid and rainfall is relatively infrequent, so that there should quite often be occasions when surfaces are dry. Type I conditions (Appendix fig. 58) are preferable.

Best hours: 1400 during daylight; 2100 at night.

June. -- Rank: 5

Rating: Fair

Snow cover has disappeared and surfaces should be dry. Winds average 4 to 9 m.p.h. Type I conditions (Appendix fig. 58) should be utilized.

Best hours: about 1415 during daylight; 2215 at night.

July. -- Rank: 1

Rating: Good

Precipitation is low, wind velocities are favorable (4 to 13 m.p.h.), and drying occurs rapidly after rain. Utilize Type I conditions (Appendix fig. 58).

Best hours: 1415 during daylight; 2215 at night.

August. -- Rank: 4

Rating: Good

Rainfall increases and wind velocities decrease, averaging 4 to 11 m.p.h. Type I conditions (Appendix fig. 58) are most favorable.

Best hours: 1400 during daylight; 2130 at night.

September. -- Rank: 10

Rating: Poor

This is the month of maximum precipitation (Appendix fig. 3 and Appendix table 1). Wind velocities are moderately high, averaging 4 to 11 m.p.h.; drying conditions are fair (Appendix table 2). Type I and II conditions are best (Appendix figs. 58 and 59) for incendiary raids.

Best hours: 1345 during daylight; 2030 at night.

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October. -- Rank: 3

Rating: Good

Precipitation is fairly high (Appendix fig. 3) and there may be snow toward the end of the month. In spite of these conditions, this is a good month, because of high winds (4 to 13 m.p.h.) and good drying conditions (Appendix table 2). Type I and II conditions are best (Appendix figs. 58 and 59).

Best hours: 1400 during daylight; 1930 at night.

November. -- Rank: 9

Rating: Poor

Snow cover usually exists, but if snows are late, Type II conditions (Appendix fig. 59) may offer excellent opportunities for incendiary raids. Icing conditions may be found at low levels throughout the month, becoming more frequent as the month progresses.

Best hours: 1345 during daylight; 1830 at night.

December. -- Rank: 11

Rating: Poor

Snow cover is deep and decreases incendiary effectiveness. Wind velocities average 4 to 18 m.p.h. If raids are made, Type II conditions (Appendix fig. 59) are best.

Best hours: 1330 during daylight; 1815 at night.

Target Area 2

Wind velocities are not as high in target area 2, on the eastern side of Hokkaido, as they are on the western side in target area 1. Highest mean velocities--up to 13 m.p.h. on the average--occur from October through May; but from November through April a deep snow cover, frequent low ceilings, and icing make conditions generally unfavorable for incendiary raids. Best 3 months are May, October, and June, in the order listed.

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January. -- Rank: 7

Rating: Fair

Snow cover is deep; snowfall occurs on the average on 21 days at Hakodate (Appendix fig. 7). Wind velocities average 4 to 11 m.p.h. If raids are made, Type II conditions are best (Appendix fig. 59), with the cold front just to the east of the area, and the effects of accompanying disturbances not extending westward over the target. Icing conditions may be expected to prevail at low altitudes, and bombing, therefore, may have to be carried out only from high levels. Clear conditions should obtain frequently, however, and make accurate high-altitude bombing possible.
Best hours: 1330 during daylight; 1845 at night.

February. -- Rank: 5

Rating: Fair

Snow cover persists with snowfall still high (Appendix figs. 3 and 7). Winds average 4 to 13 m.p.h. Type II conditions are best (Appendix fig. 59). Icing may be expected at low levels.
Best hours: 1345 during daylight; 1930 at night.

March. -- Rank: 6

Rating: Fair

Snow cover persists; usually icing conditions still will be encountered. Type II conditions are best (Appendix fig. 59).
Best hours: 1345 during daylight; 1930 at night.

April. -- Rank: 4

Rating: Fair

In the latter part of the month snow disappears along the southern coastal portion of the area. Winds average 7 to 11 m.p.h. Type I or II conditions are best (Appendix figs. 58 and 59).
Best hours: 1400 in daylight; 2100 at night.

May. -- Rank: 1

Rating: Good

Snow has disappeared in south and central portions of the area and snow cover should be thin at higher elevations and in the north. Wind velocities average 7 to 11 m.p.h. Precipitation is low (Appendix figs. 3 and 7); drying conditions are favorable. Best conditions are Type I (Appendix fig. 58).
Best hours: 1415 during daylight; 2200 at night.

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June. -- Rank: 3
Rating: Fair
Snow has disappeared; rainfall is relatively low (Appendix figs. 3 and 7). Wind velocities average 4 to 9 m.p.h. Drying is rapid. Type I conditions are best (Appendix fig. 58).
Best hours: 1430 during daylight; 2215 at night.

July. -- Rank: 10
Rating: Poor
This is one of the rainiest months, with totals of more than 5 inches in parts of the area (Appendix figs. 3 and 7). Wind velocities are low, averaging 4 to 7 m.p.h.; clear days are rare; ceilings are low. If incendiary raids are made, use Type I conditions (Appendix fig. 58).
Best hours: 1500 during daylight; 2200 at night.

August. -- Rank: 11
Rating: Poor
Wind velocities average 4 to 7 m.p.h. Rainfall is more than 5 inches, the highest monthly amount for the year at many stations. Drying conditions are poor; overcast is frequent. Type I conditions are best (Appendix fig. 58).
Best hours: 1430 during daylight; 2130 at night.

September. -- Rank: 12
Rating: Poor
Precipitation is high; wind velocities average 4 to 9 m.p.h.; and drying conditions are poor. Type I conditions may occur occasionally, as may also Type II (Appendix figs. 58 and 59). These should be utilized if raids are contemplated.
Best hours: 1415 during daylight; 2100 at night.

October. -- Rank: 2
Rating: Good
Wind velocities average 4 to 13 m.p.h. Snows do not set in until the latter part of the month, and then only in the northernmost part of the area and in the highlands. Precipitation is moderately high, but drying conditions are good. Both Type I and Type II conditions are apt to be encountered and should be utilized (Appendix figs. 58 and 59).
Best hours: 1400 during daylight; 1930 at night.

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November. -- Rank: 8

Rating: Poor

Snow is apt to set in shortly after the beginning of the month, but wind velocities are high--4 to 13 m.p.h.--and under Type II conditions may favor incendiary bombing (Appendix fig. 59). Icing conditions are apt to exist at low levels under these synoptic conditions.

Best hours: about 1330 during daylight; about 1830 at night.

December. -- Rank: 9

Rating: Poor

Snow cover exists throughout the area. Winds average 4 to 11 m.p.h. Under clear conditions after a cold-front passage in synoptic situations represented by Type II (Appendix fig. 59), raids can profitably be made.

Best hours: 1300 during daylight; 1815 at night.

Target Area 3

This is one of the less favorable target areas for incendiary bombing. Wind velocities are low from May through October, averaging up to 7 m.p.h., and during all but two of the remaining months (November and April) there is apt to be snow on the ground. Icing conditions will be encountered frequently from November through April, but clear, cold days on which icing will present no grave problem will also be found throughout the winter. May through October is the period of heaviest precipitation, and this, combined with low wind velocities, make all of these months "poor" for incendiary raids. November, December, and April, which are rated "fair," rank first, second, and third, respectively.

January. -- Rank: 4

Rating: Fair

Chief disadvantage for large-scale incendiary raids is the probability of a snow cover which will inhibit the rate of spread of fire. However, in the extreme south, along the coast, snow is usually not present in early January, and therefore incendiary raids can profitably be made in this part of the target area. Clear days are numerous; wind velocities average 4 to 11 m.p.h. There will be severe icing conditions to the west of the mountains and over the mountains at lower levels, so that planes will have to come in high, descending over the target along the east coast in this area. Icing will usually not be severe along this coast under Type II conditions, if sufficient time is allowed after the passage of the cold front (Appendix fig. 59). Type II conditions therefore can be utilized.

Best hours: 1300 during daylight; 1900 at night.

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February. -- Rank: 6

Rating: Fair

There is probability of snow cover; winds average 4 to 11 m.p.h. Drying conditions are good. Frequent clear days may be expected and should be utilized after passage of a cold front under Type II conditions, when icing will probably be light (Appendix fig. 59).
Best hours: 1400 during daylight; 1930 at night.

March. -- Rank: 5

Rating: Fair

Snow cover persists. Wind velocities average 7 to 11 m.p.h. Drying conditions are good. If 2 or 3 weeks elapse without appreciable snowfall, raids may profitably be made along the southern coast of the area. Icing conditions usually will not be severe at high altitudes under Type II conditions (Appendix fig. 59).
Best hours: 1500 during daylight; 2000 at night.

April. -- Rank: 3

Rating: Fair

Snow is disappearing or is completely gone in the south along the coast. Winds average 4 to 9 m.p.h. Drying conditions are good. Plans should be made for incendiary raids, particularly in the latter half of the month, under Type I or Type II conditions (Appendix figs. 58 and 59).
Best hours: about 1430 during daylight; 2030 at night.

May. -- Rank: 7

Rating: Poor

Rains have started during this month and wind velocities are relatively low, averaging 4 to 7 m.p.h. Type I conditions are best (Appendix fig. 58). There should be no severe icing conditions.
Best hours: 1500 during daylight; 2115 at night.

June. -- Rank: 8

Rating: Poor

Precipitation amounts and frequencies increase markedly over May (Appendix figs. 3 and 8). Winds average only 4 to 7 m.p.h. Type I conditions are best for raids (Appendix fig. 58).
Best hours: 1500 during daylight; 2130 at night.

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July. -- Rank: 9

Rating: Poor

Precipitation is still high, particularly in the northern part of the area (Appendix figs. 3 and 8). Velocities average 4 to 7 m.p.h. Drying conditions are poor and the number of clear days averages only 0 to 2. If incendiary raids are made, they should be carried out under Type I conditions (Appendix fig. 58).

Best hours: about 1430 during daylight; 2130 at night.

August. -- Rank: 11

Rating: Poor

Rainfall is less frequent than in July, although totals are as high or higher (Appendix figs. 3 and 8). Drying conditions are fair; wind velocities average 4 to 7 m.p.h. If raids are made, Type I conditions are best (Appendix fig. 58).

Best hours: 1400 during daylight; 2100 at night.

September. -- Rank: 12

Rating: Poor

This is the rainiest month in this area (Appendix figs. 3 and 8). Drying conditions are only fair. Winds average between 4 and 7 m.p.h. If incendiary raids are made, they should take place under Type I conditions (Appendix fig. 58).

Best hours: 1430 during daylight; 2015 at night.

October. -- Rank: 10

Rating: Poor

Winds average 2 to 7 m.p.h. Drying conditions are fair. Icing at low levels may be expected with increasing frequency towards the end of the month. Come in at high levels (above 15,000 feet over the mountains) and descend over the east coast, where, under Type II conditions, icing should be light except at the lowest levels (Appendix fig. 59).

Best hours: 1430 during daylight; 1915 at night.

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November. -- Rank: 1

Rating: Fair

Precipitation is comparatively low and infrequent (Appendix figs. 3 and 8). Snowfall starts only in the latter part of the month at high elevations and in the north. Winds average 4 to 9 m.p.h. Clear days average 0 to 12, with the highest number occurring in the coastal part of the area. Raids should be made under Type II conditions (Appendix fig. 59), with the planes coming in at a high altitude when approaching the mountains in order to avoid severe icing conditions.

Best hours: 1300 during daylight; 1830 at night.

December. -- Rank: 2

Rating: Fair

This is a "good" month in the extreme south; "fair" in the north. Winds average 4 to 9 m.p.h. More than one-half the days are clear in the coastal areas. Drying conditions are excellent; precipitation is low. Raids should be made under Type II conditions, with the planes approaching at high altitudes in order to avoid severe icing (Appendix fig. 59).

Best hours: 1400 during daylight; 1815 at night.

Target Area 4

Winds in this area are moderately high to very high, except during the months of August and September. Precipitation is highest during the winter, and this, combined with severe icing conditions at low altitudes and snow on the ground, makes the winter rate only "fair" for incendiary raids, despite the fact that there are extremely high surface winds to spread fire. The best time of the year for incendiary raids is late spring and early summer, May and June being rated as "good" months, and April "fair."

January. -- Rank: 7

Rating: Poor

Winds are high, averaging 4 to 16 m.p.h., but ceilings are frequently low, with severe icing conditions prevailing, so that it is hazardous to come through the overcast to bomb objectives. Snow is apt to be deep on buildings, cutting down the rate of spread of fire. If raids are made with planes carrying large incendiary loads, utilize Type II conditions (Appendix fig. 59).

Best hours: about 1400 during daylight; 1845 at night.

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February. -- Rank: 6

Rating: Poor

Snow cover still persists. The icing hazard is great, particularly at low levels. Drying conditions are good. Await Type II conditions, with the cold front just off the east coast (Appendix fig. 59).

Best hours: 1400 during daylight; 1915 at night.

March. -- Rank: 8

Rating: Poor

Snow cover and icing conditions persist. Precipitation is less frequent than in January or February (Appendix figs. 3 and 9). Winds average 7 to 11 m.p.h. Use Type I and II conditions for bombing raids (Appendix figs. 58 and 59).

Best hours: 1430 during daylight; 2000 at night.

April. -- Rank: 3

Rating: Fair

Snow disappears in the latter part of the month along the southern coast. Winds average 4 to 9 m.p.h. Drying conditions are good. Icing may be expected at low levels, but should not be severe during the latter part of the month. Type I or II conditions are best for raids.

Best hours: 1430 during daylight; 2030 at night.

May. -- Rank: 1

Rating: Good

Snow has disappeared from the ground. Winds average 4 to 11 m.p.h. Drying conditions are good. This is the month of least precipitation; total rainfall is less than 5 inches throughout the coastal area (Appendix figs. 3 and 9). Type I conditions are best for raids (Appendix fig. 58).

Best hours: 1430 during daylight; 2115 at night.

June. -- Rank: 2

Rating: Good

Wind average 4 to 9 m.p.h. Drying conditions are good. Except in the extreme southern part of the area, precipitation is below 5 inches and throughout much of the area the number of days with precipitation is lower than for any other month except August (Appendix figs. 3 and 9). Type I synoptic conditions are best (Appendix fig. 58).

Best hours: 1430 during daylight; 2130 at night.

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July. -- Rank: 10

Rating: Poor

A marked increase in precipitation makes this month much less favorable than June (Appendix figs. 3 and 9). Clear days are less frequent than in June, averaging 4 or less throughout the area. Relative humidity averages between 75 and 90 percent. If incendiary bombing raids are made, utilize Type I conditions (Appendix fig. 58).
Best hours: 1430 during daylight; 2130 at night.

August. -- Rank: 9

Rating: Poor

This month has next to the smallest amount of mean precipitation, having less than either July or September. Principally for this reason, conditions are more favorable than in July and September, even though wind velocities average only 4 to 7 m.p.h. The number of rainy days is comparatively low, however, precipitation being concentrated in heavy showers. At Akita, for example, there is an average of 13 rainy days a month, the lowest frequency of any month (Appendix fig. 9). Clear days average between 2 and 6, decreasing inland toward the mountains. Best synoptic conditions are represented by Type I (Appendix fig. 58).
Best hours: 1400 during daylight; 2100 at night.

September. -- Rank: 12

Rating: Poor

This is one of the rainiest months, mean precipitation being in excess of 8 inches throughout most of the area (Appendix fig. 3). In addition, wind velocities are low, averaging 4 to 7 m.p.h., and ceilings and visibilities also are apt to be low. If incendiary raids are made during this month, take advantage of Type I or II conditions (Appendix figs. 58 and 59), which may occur in the latter part of the month.
Best hours: 1345 during daylight; 2015 at night.

October. -- Rank: 11

Rating: Poor

This is a rainy month, with total precipitation around 7 inches. Icing is apt to occur with increased frequency as the month progresses. Wind velocities average 4 to 9 m.p.h. Drying conditions are only fair. Best synoptic conditions are Type I and II (Appendix figs. 58 and 59).
Best hours: 1345 during daylight; 1915 at night.

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November. -- Rank: 5

Rating: Fair

Care must be taken to avoid icing, which may be severe at low levels. Surface winds are fairly high, averaging 4 to 11 m.p.h. Drying conditions are fair. Best synoptic conditions are Type II (Appendix fig. 59).

Best hours: 1330 during daylight; 1830 at night.

December. -- Rank: 4

Rating: Fair

Surface winds are very high, averaging 4 to 16 m.p.h. Icing conditions Icing conditions at low levels are apt to be severe, which may preclude low-level bombing. Clear days are rare, but there should be days with only partly overcast conditions which would permit high-level bombing. Snow cover is apt to be deep toward the end of the month, even in the southern part of the area, so that the first part of the month is in general preferable for all-out incendiary raids. Best synoptic conditions are Type II (Appendix fig. 59).

Best hours: 1330 during daylight; 1815 at night.

Target Area 5

This is a target area throughout which conditions are generally poor for incendiary bombing. No months may be rated "good," and only 2 are "fair:" March and December. Wind velocities are low on the average, mean velocities being between 4 and 9 m.p.h. from December through February, and between 4 and 7 m.p.h. the remainder of the year. Icing conditions are apt to be encountered from October through March, with particularly severe icing common below 8,000 feet. Overcast conditions are common throughout the year. Precipitation is heaviest and mean precipitation is highest in the period April through September; August is the month of minimum rainfall for this period. The generally unfavorable conditions should not be interpreted as excluding the possibility of making effective incendiary raids; but the number of opportunities presented for effective incendiary bombing of objectives will be markedly less than in any of the other target areas, with the exception, perhaps, of target area 7.

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January. -- Rank: 5

Rating: Poor

Snow cover may be expected during this month, but should be deep only in the highland areas. Icing conditions are common throughout the month, being severe at levels under 8,000 feet. Wind velocities average 4 to 9 m.p.h. Type II conditions are best (Appendix fig. 59).

Best hours: 1400 during daylight; 1845 at night.

February. -- Rank: 6

Rating: Poor

Snow cover exists but should be deep only in the highlands. Icing conditions are common and particularly severe at low levels. Winds average 4 to 9 m.p.h. Precipitation is low (Appendix fig. 3) but clear days are rare, averaging 2 or less. Low ceilings are common. Best synoptic conditions are Type II (Appendix fig. 59).

Best hours: 1400 during daylight; 1915 at night.

March. -- Rank: 1

Rating: Fair

Snow has thinned or disappeared by the middle of this month. Icing conditions may still occasionally be severe, but are less frequent than they are earlier in the winter. Winds average 4 to 9 m.p.h. Type I and II conditions are best for incendiary raids (Appendix figs. 58 and 59).

Best hours: 1400 during daylight; 1945 at night.

April. -- Rank: 3

Rating: Poor

Winds average 4 to 7 m.p.h. Icing is occasionally encountered at low levels, particularly during the early part of the month. Rainfall averages about 5 inches, snow cover having disappeared in all but the highest portions of the area. Drying conditions are moderately favorable. Best conditions are Type I and II (Appendix figs. 58 and 59).

Best hours: 1300 during daylight; 2015 at night.

May. -- Rank: 4

Rating: Poor

Rainfall is about 5 inches. Snow has entirely disappeared. Winds average 4 to 7 m.p.h. Clear days average between 2 and 6 for the month.

Best synoptic conditions are Type I (Appendix fig. 58).

Best hours: 1400 during daylight; 2045 at night.

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June. -- Rank: 12

Rating: Poor

Precipitation is more than 8 inches. Winds average 4 to 7 m.p.h. Clear days average 0 to 4. Best synoptic conditions are Type I (Appendix fig. 58).

Best hours: 1230 during daylight; 2100 at night.

July. -- Rank: 11

Rating: Poor

Precipitation is still high, averaging more than 8 inches throughout most of the area. Winds average 4 to 7 m.p.h. Clear days are few, averaging 0 to 4. Best synoptic conditions for raids are Type I (Appendix fig. 58).

Best hours: 1500 during daylight; 2100 at night.

August. -- Rank: 9

Rating: Poor

Low wind velocities (4 to 7 m.p.h.) and rainfall in excess of 5 inches make this a "poor" month. But conditions are markedly more favorable than in either July or September. There are 2 to 6 clear days on the average. Use Type I conditions if possible (Appendix fig. 58).

Best hours: 1230 during daylight; 2045 at night.

September. -- Rank: 10

Rating: Poor

Mean rainfall is in excess of 8 inches during September, and the number of rainy days is greater than in August. Rains are apt to be prolonged, lasting more than 24 hours. Winds average 4 to 7 m.p.h. Clear days average 0 to 4. If raids are made, use Type I or II conditions (Appendix figs. 58 and 59), preferably the latter.

Best hours: 1400 during daylight; 2000 at night.

October. -- Rank: 8

Rating: Poor

The mean rainfall is less than 5 inches in the coastal parts of the area. Wind velocities average 4 to 7 m.p.h. Icing conditions in the lower levels may be severe, particularly toward the end of the month. Both Type I and II conditions may be utilized for incendiary bombing (Appendix figs. 58 and 59).

Best hours: 1400 during daylight; 1915 at night.

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November. -- Rank: 7

Rating: Poor

November marks the beginning of the driest three-month period. Since there is no snow during this month, surfaces of buildings are apt to be drier than in any other month. These positive factors, however, are outweighed by the negative ones. There will be only a few clear days (an average of 2 to 6) during which high-altitude bombing will be possible. The chief hazard is icing, which may be especially severe in the lower levels along the coast. Surface wind velocities average 4 to 7 m.p.h. Pest synoptic situation is Type I (Appendix fig. 58). Type II conditions also afford opportunities for incendiary raids (Appendix fig. 59). Icing conditions are apt to be less severe under Type I conditions than under Type II, however.

Best hours: 1200 during daylight; 1830 at night.

December. -- Rank: 2

Rating: Fair

Snow does not set in until the latter part of the month. Precipitation is less than 5 inches on the average. Drying conditions are good. Winds average 4 to 9 m.p.h. Icing conditions are common, but a few clear days (average 0 to 4) will usually occur, making high-altitude bombing possible. Utilize Type I or II conditions (Appendix figs. 58 - 59). Type I conditions are the more favorable of the two because of less icing hazard.

Best hours: 1200 during daylight; 1830 at night.

Target Area 6

This area extends from Tokyo south along the eastern side of the islands of Honshu, Shikoku, and Kyushu (Appendix fig. 2). It includes the important industrial centers of Tokyo-Yokahama, Nagoya, Osaka-Kobe, Koti, and Miyasaki, and is, in fact, the most important industrial area of Japan. Fortunately, it is the best of the seven target areas so far as weather conditions affecting incendiary bombing are concerned.

Six of the 12 months are rated "good" or better. They are, in order, December, which is rated "excellent," and March, April, August, January, and November, which are all "good." Only 2 months, June and July, are "poor." The remainder are "fair."

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Even with soupy weather along the west coast, conditions in this target area are usually favorable for bombing. In winter, there are often very low ceilings along the west coast, with severe icing conditions in lower levels, while concurrently clear, windy, high-level bombing conditions prevail to the east of the mountains. Such weather patterns are apt to occur with the outbreak of cold polar air from over Siberia. This cold air pushes out over the Sea of Japan, where it picks up considerable moisture in its lower layers, since the temperature of the surface water is very high. Hence, bad weather--low ceilings, low visibility, and icing conditions--sets in along the west coast. This same air, however, passing over the mountains to the east coast, produces clear conditions with good flying weather. The reason for this is that, first, air introduced to the east coast is principally from aloft, and second, even when surface air passes up over the mountains, it is warmed adiabatically in descending on the east side, and the temperature rises above the dew point with concurrent disappearance of cloud and fog. The principal exception to this combination of adverse weather to the west, over target areas 4 and 5, with good weather over target area 6 in the east, is found in a synoptic setup in which there is cold-front activity along the east coast. Therefore, it would be best to make incendiary raids during winter after a frontal passage, waiting for clouds to clean out before moving in. Such a general condition is shown in Appendix figure 59, which is referred to as a Type II situation.

Icing conditions may be encountered over this target area from October through April, but severe icing conditions will be associated with frontal passages, and icing is far less of a hazard here than it is along the west coast. The occurrence of numerous clear days in winter indicates that there will be many instances when raids can be made without the danger of excessive icing. When raids are made from the west, it will usually be necessary to come in very high over the west coast and mountains to avoid icing in those areas, but it will then be possible on clear, cold days to descend over targets along the east coast. Such conditions should be ideal, since they lessen the chances of pursuit ships from the west coast taking off to intercept returning bombers.

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Snow cover is found in sufficient quantities to be a deterrent to the spread of fire only in the northern part of the area, in January, February, and March. Heavy and frequent precipitation occurs principally in June, July, and September, although around Tokyo, near the northern edge of the target area, August and October also are rainy.

January. -- Rank: 5

Rating: Good

There are from 2 to 16 clear days on the average in this month. Clear days occur more frequently in the north than in the south, and with greater frequency at coastal locations than inland towards the mountains. Surface wind velocities are high, averaging 4 to 13 m.p.h. Precipitation is lower than in any other month, being less than 3 inches. Snow cover may be present in the north and in the highlands, but at least during the early part of the month, a deep cover of snow in the central and southern coastal regions is rare. Drying conditions are excellent; relative humidity is low, sunshine abundant, and winds high. This means that surfaces of buildings will usually dry quickly after frontal showers. Icing conditions may exist but will be severe only in frontal or immediate post-frontal zones. Best conditions are Type II (Appendix fig. 59).

Best hours: 1300 during daylight; 1900 at night.

February. -- Rank: 8

Rating: Fair

Chief deterrent to successful incendiary bombing is the likelihood of a snow cover, at least in the central and northern parts of the area. There are apt to be several clear days which favor bombing, however, with the average number varying from 0 in the mountains to 10 in the northern coastal region. Precipitation is low, being less than 3 inches; surface wind velocities are high, averaging 4 to 13 m.p.h. Severe icing accompanies frontal passages, but will be absent in most other synoptic situations. Best conditions are Type II (Appendix fig. 59).

Best hours: 1330 during daylight; 1915 at night.

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March. -- Rank: 2

Rating: Good

Precipitation during this month averages less than 5 inches (Appendix figs. 3 and 5). Snow cover is thin or has disappeared in the southern and central coastal portions of the area and by the middle of the month should not be deep in the northern part of the area. There are 2 to 8 clear days, on the average. Surface winds average 4 to 13 m.p.h. Drying conditions are excellent; winds are high, relative humidity averages 60 to 75 percent, and there is considerable sunshine (Appendix fig. 26). Icing conditions will exist, but severe icing will be associated principally with frontal passages. Both Type I and II synoptic situations are favorable for incendiary raids (Appendix figs. 58 and 59). Of these, Type II is preferable.

Best hours: 1400 during daylight; 1945 at night.

April. -- Rank: 3

Rating: Good

Snow has disappeared throughout the coastal area and has almost disappeared in the highland areas. Precipitation averages about 5 inches, being somewhat higher than in March. Surface winds remain strong, averaging 4 to 11 m.p.h. Icing conditions are not frequent and will be associated principally with cold-front passages. Both Type I and II conditions may be utilized for incendiary raids (Appendix figs. 58 and 59).

Best hours: 1400 during daylight; 2030 at night.

May. -- Rank: 7

Rating: Fair

Precipitation is slightly more than 5 inches in the northern part of the area and is as high as 10 inches in the southern part. Drying conditions are only fair; relative humidity averages 70 to 85 percent; clear days average 0 to 6; wind velocities average 4 to 11 m.p.h. Type I conditions are favorable for incendiary bombing (Appendix fig. 58).

Best hours: 1400 during daylight; 2045 at night.

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June. -- Rank: 12

Rating: Poor

This is one of the two rainiest months; September is the other (Appendix fig. 3). Total rainfall averages from about 16 inches in the southern part of the area to 7 inches in the north. Heavy thundershowers account for most of the precipitation. Clear days are few, averaging 0 to 4. Surface wind velocities are comparatively low for the area, averaging 4 to 9 m.p.h. Drying conditions in general are poor, so that surfaces of buildings will be wet much of the time. If raids are made, Type I conditions are best (Appendix fig. 58).
Best hours: 1400 during daylight; 2115 at night.

July. -- Rank: 11

Rating: Poor

Rainfall is still heavy in this month, averages varying from more than 12 inches in the south to about 5 inches in the northern coastal area. Winds average 4 to 9 m.p.h. Drying conditions are poor; relative humidity averages 75 to 90 percent, clear days average 0 to 4. Best conditions are represented by Type I (Appendix fig. 58).
Best hours: 1400 during daylight; 2115 at night.

August. -- Rank: 4

Rating: Good

This is a particularly good month for the Osaka-Kobe and Nagoya areas. It is slightly less favorable for the Tokyo area, and is least favorable for the extreme south, where August rainfall is high (Appendix fig. 3). Appendix figures 48 and 49 illustrate the extent to which conditions favor incendiary operations at Osaka and Tokyo during this month. (See discussions for these two cities on pages 35-36). Although rainfall totals average more than 5 inches in parts of the area, the precipitation is concentrated in a few major storms, with generally clear or at worst partly cloudy weather prevailing in between. There is more sunshine than in any other month (Appendix fig. 31), considering the area as a whole, and this favors rapid drying. Hence successful raids can be made with high surface wind velocities, provided that 24 hours have elapsed since the last rain and also that high surface winds and clear skies have promoted drying since the rain. This frequently will occur. Surface winds average 4 to 11 m.p.h. There are 0 to 6 clear days, on the average, the number being highest in the Osaka-Kobe and Nagoya areas. In making raids, utilize Type I conditions whenever possible (Appendix fig. 58).
Best hours: 1430 during daylight; 2100 at night.

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September. -- Rank: 10

Rating: Fair

Precipitation is in excess of 5 inches throughout the area, the mean amount increasing northward to become slightly more than 10 inches in the extreme north at Tokyo (Appendix fig. 3). Frequency of precipitation is also high, over 15 days a month at many stations (Appendix fig. 5 and Appendix table 1). Drying conditions are fair, surface winds average 4 to 11 m.p.h., and relative humidity averages 75 to 85 percent. Both Type I and II conditions may be profitably utilized for incendiary raids (Appendix figs. 58 and 59). Icing conditions may occur toward the end of the month at levels around 8,000 feet, but will tend to be associated principally with cold-front passages.

Best hours: 1500 during daylight; 2000 at night.

October. -- Rank: 9

Rating: Fair

Precipitation during this month averages about 8 inches in the northern coastal part of the area and slightly less than 5 inches in the southern coastal part. Rain occurs on approximately half the days in the north and about 1 out of 3 days in the south. Winds average 4 to 11 m.p.h. Clear days average 2 to 8 for the month (Appendix fig. 45); the number of clear days is highest in the Kobe-Osaka area and in the extreme south. Drying conditions are fair; relative humidity averages 75 to 85 percent; surface winds are moderately high; there is a fair amount of sunshine (Appendix fig. 33). Icing conditions will occur, but severe icing will be associated only with frontal passages. Either Type I or II conditions are favorable for incendiary raids, but the latter type is preferable (Appendix figs. 58 and 59).

Best hours: 1430 during daylight; 1915 at night.

November. -- Rank: 6

Rating: Good

Precipitation is less than 4 inches throughout most of the coastal area. Precipitation occurs on about 1 out of 3 days. Winds average 4 to 11 m.p.h. Clear days average 2 to 6. Both low- and high-altitude bombing should be possible in this month. Type II conditions are favorable for both (Appendix fig. 59). Type I conditions are more apt to be accompanied by moderate icing conditions at low altitudes, and are therefore better for high-altitude bombing through thin- to broken-cloud cover. Severe icing will be associated with frontal passages.

Best hours: 1200 during daylight; 1830 at night.

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December. -- Rank: 1

Rating: Excellent

Even though there may be a light snow cover during the latter part of the month in the extreme northern part of the area and in the highlands, this is the best month for incendiary raids in this area, better in fact, than is any other month in any other Japanese target area. Conditions are particularly favorable in the north and central parts of the area, where the number of clear days is the highest. Clear days average 2 to 16. Winds average 4 to 11 m.p.h. On clear, cold days, which will occur in succession, winds are apt to be high and surfaces of buildings dry. Targets will be clearly visible so that high-altitude bombing will be possible. Icing conditions on such days will not be severe at any levels, provided time is allowed for the cold front to move through and clean out the "weather" behind the front. The best conditions for bombing are described in the general section on this area. Best synoptic conditions are Type II (Appendix fig. 59).
Best hours: 1230 during daylight; 1830 at night.

Target Area 7

This target area comprises the central and western part of Kyushu, the extreme southeastern part of Honshu, and the western coastal portions of Shikoku (Appendix fig. 2). It is principally an intermontane area, the northern part of which is bounded by the mountains to the west on Honshu and to the east on Shikoku, and which embraces the principal mountains of Kyushu. This in part explains the low wind velocities which obtain at the surface throughout the year. Mean monthly velocities nowhere exceed 9 m.p.h., but velocities in any 1 hour may of course be considerably higher. These low surface velocities are partly responsible for the fact that this is a poor target area for incendiary bombing. Other factors are low ceilings and visibilities, which are due to the influx of moist air, principally from the south and west. High precipitation also contributes to the low ratings accorded conditions in this area. During the months of June and July more than 10 inches of precipitation occur in each month, on the average. Precipitation is at a minimum during the winter, when less than 4 inches occur (Appendix fig. 3). The number of clear days is highest in winter. Icing conditions in winter, however, are apt to be severe in the low levels.

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No month rates as high as "good" on the rating scale. Four months are rated "fair." They are, in order of rank, October, March, January, and February. October and March were ranked ahead of the 2 winter months because of less frequent severe icing conditions, even though surface winds are somewhat higher in the winter months. Despite the low ratings accorded this target area, there will be days in every month when successful incendiary raids can be made. It will be possible to forecast these days in advance, but particular care should be taken to avoid icing conditions in winter and to avoid days of heavy precipitation in summer. In avoiding these conditions, it may be necessary to engage in low-altitude bombing from underneath a high overcast or to bomb from high altitudes through "holes" in a broken overcast. The one exception that can be counted on to occur will be the clear, cold days of winter when the area is inundated by cold polar air, thus making high-altitude bombing feasible. Such days will occur in the eastern part of the area but are not to be expected in the west.

January. -- Rank: 3

Rating: Fair

Precipitation during this month is less than 3 inches throughout most of the area. Snow may cover the ground but will be thin in the coastal parts of the area. Surface winds average 4 to 9 m.p.h. Clear days average 2 to 8, the greatest number occurring in localities in the eastern part of the area, on the eastern slopes of the central mountains. Icing conditions are apt to be severe, particularly in the lower levels, and particularly in areas along the west and southwest coasts. This includes the industrial area around Nagasaki. It may be necessary to utilize high-altitude bombing over these western coastal areas because of the almost constant hazard of icing in the lower levels. Best synoptic conditions are Type I and II (Appendix figs. 58 and 59). Type I is preferable for west coast locations, because it is apt to be accompanied by off-shore winds and less severe icing. Type II is preferable for stations in the eastern part of the area, which is separated from the Sea of Japan by mountain ranges.

Best hours: 1400 during daylight; 1900 at night.

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February. -- Rank: 4

Rating: Fair

The same conditions obtain for February as for January, except that there are somewhat fewer clear days, the average being 2 to 6. Also, precipitation is somewhat greater, averaging 4 inches, with snow cover slightly deeper, but still not sufficiently deep in the coastal parts of the area to hamper seriously the spread of fire.

Best hours: 1400 during daylight; 1915 at night.

March. -- Rank: 2

Rating: Fair

Precipitation in this month is slightly in excess of 5 inches in the lowland areas (Appendix figs. 3 and 4). Winds average 4 to 7 m.p.h. Clear days average 2 to 6, the greatest number occurring in the extreme part of the area, on the island of Kyushu. Although icing conditions are still apt to be severe, the frequency of occurrence of these conditions is not as great as in the 2 preceding months. It should be possible, under Type I conditions (Appendix fig. 58), to make low-altitude, as well as high-altitude bombing attacks without icing conditions being critical. High-altitude attacks can be made under Type II conditions (Appendix fig. 59), but icing at low levels may interfere with descending very low over the target, and a broken-cloud condition may exist.

Best hours: 1400 during daylight; 1945 at night.

April. -- Rank: 5

Rating: Poor

Precipitation averages between 7 and 9 inches in this month (Appendix figs. 3 and 4). Clear days average 2 to 6. Surface winds average 4 to 7 m.p.h. Severe icing conditions will occur occasionally, but frequently it will be possible to come in below the icing level. Other hazards are thunderstorms, particularly during the latter part of the month, and low visibilities and ceilings, especially along the west and southwest coasts. Best conditions are Type I (Appendix fig. 58) for the western parts of the area, and Type II (Appendix fig. 59) for the eastern parts, on the leeward slopes away from the Sea of Japan.

Best hours: 1300 during daylight; 2015 at night.

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May. -- Rank: 9

Rating: Poor

Precipitation averages 7 to 8 inches in the lowlands, and occurs on an average of slightly less than one-half the days of the month. Clear days average only 2 to 4. It is advisable not to wait for perfectly clear days to make raids, since such days are extremely rare particularly in the western and southwestern coastal parts of the area and in the region surrounding the Suwo Nada portions of the area. It will be more practicable to count on coming in under a high overcast for low-level bombing. Icing at high levels will occasionally be severe, but it will usually be safe, so far as icing is concerned, to come in low. Best synoptic conditions are Type I (Appendix fig. 58).

Best hours: 1330 during daylight; 2045 at night.

June. -- Rank: 12

Rating: Poor

This is a month of frequent and heavy storms. Precipitation averages more than 12 inches in many parts of the area (Appendix fig. 3). Clear days are practically non-existent, averaging 0 to 2 for the area as a whole. Because of the frequent heavy rains, the high frequency of thundershowers, low surface wind velocities (average 4 to 7 m.p.h.), and high average cloudiness, it is questionable whether successful incendiary raids can be made in this month. If raids are made, however, try to utilize Type I conditions (Appendix fig. 58).

Best hours: 1300 during daylight; 2100 at night.

July. -- Rank: 10

Rating: Poor

This is also a month of heavy, frequent rains. Surface wind velocities average 4 to 7 m.p.h.; relative humidity averages 75 to 85 percent. It will be difficult, therefore, to find days on which the surfaces of buildings are not wet. If raids are made, Type I conditions are best (Appendix fig. 58).

Best hours: 1430 during daylight; 2100 at night.

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August. -- Rank: 8

Rating: Poor

For the area as a whole this is a "poor" month, but for the region around Nagasaki it is "fair" (Appendix fig. 50). Precipitation averages about 7 inches, and occurs on slightly less than one-half the days at lowland stations. Thunderstorms are frequent, and also conditions with low visibility and low ceilings. Clear days average 0 to 6 and are highest in number in the extreme eastern part of the area, on the island of Kyushu. Surface winds average 4 to 7 m.p.h. Best synoptic conditions are Type I (Appendix fig. 58).

Best hours: 1200 during daylight; 2045 at night.

September. -- Rank: 11

Rating: Poor

Precipitation averages about 8 inches in the lowlands and occurs on about one-half the days (Appendix figs. 3 and 4). Surface winds average 4 to 7 m.p.h. Clear days average 0 to 4; the highest number occurs in the eastern part of the island of Kyushu. Best synoptic conditions are represented by Type I (Appendix fig. 58).

Best hours: 1200 during daylight; 2000 at night.

October. -- Rank: 1

Rating: Fair

Precipitation averages 5 inches in the lowland parts of the area. Clear days average 2 to 8; the highest number occurs in the southern and southwestern parts of the area. This is not only the best general month for the area as a whole, it is emphatically the best month for the coastal industrial area, including Nagasaki, along the southern and southwestern shores of Kyushu. The reason for this is that cyclonic conditions have not yet become frequent enough to interfere continuously with accurate bombing operations. Low-level raids can be made and clear days will occur when high-level raids can be made. Unfortunately, surface winds average only 4 to 7 m.p.h., but under Type I synoptic conditions there will be fresh breezes which will help to spread fire. Type II conditions are useful mainly in operating against localities in the eastern part of the area, on the mountain slopes or in valleys facing away from the Sea of Japan.

Best hours: 1300 during daylight; 1915 at night.

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November. -- Rank: 7

Rating: Poor

Cyclonic conditions are more frequent during this month, particularly along the west and southwest coasts and around Suwo Nada. Clear days average 2 to 10; the highest number occurs in the southeast usually, but also fairly frequently in the southwest (Appendix fig. 46). High-altitude bombing will be most practicable along the western and southwestern coasts. Winds average 4 to 7 m.p.h. Type I and II conditions are best (Appendix figs. 58 and 59).

Best hours: 1230 during daylight; 1830 at night.

December. -- Rank: 6

Rating: Poor

Overcast conditions are very frequent along the west and southwest coast during this month. Visibilities and ceilings become very low. However, in the eastern part of Kyushu clear days average as high as 10 for the month. Precipitation for the lowland areas is less than 4 inches. Snow is rare in the lowlands and will not be deep enough to interfere with the spread of fire. Winds average 4 to 7 m.p.h. Type I and II conditions are best (Appendix figs. 58 and 59), but count on operating against only the eastern part of this target area.

Best hours: 1130 during daylight; 1830 at night.

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INCENDIARY BOMBING OF TOKYO, OSAKA, AND NAGASAKI

The purpose of this section of *Weather Factors Affecting the Incendiary Bombing of Japan* is to call attention to the specialized data prepared for these particular cities and to illustrate the manner in which these data should be used. The rating system used in compiling the data has already been discussed in the first section of this report. All that will be done here is to list the graphic and tabular data withhreferences to figure and table numbers and to iilustrate how these may be employed.

Data presented for Tokyo: Appendix figure 48; Appendix tables 3 and 6.
Data presented for Osaka: Appendix figure 49; Appendix tables 4 and 7.
Data presented for Nagasaki: Appendix figures 50 and 51; Appendix tables 5 and 8..

As will be seen by reading the description of the rating system used and by referring to table I, the frequencies for "good" or better, "excellent" or better, and "superior" conditions by months were calculated on the basis of burning conditions without reference to operational conditions affecting actual bombing. These charts and data are therefore to be considered solely as showing the number of *opportunities* presented each month for effectively burning a city after ignition has occurred. For information on flying conditions and for estimates of how the different months compare when flying conditions also are taken into account, reference should be made to the month-by-month resumés given for each target area.

In using the graphic and tabular data which show burning conditions, it must be understood that for all 3 cities the data were compiled for the hour of mean maximum wind. The exact hour used is shown on each of the tables (Appendix tables 6, 7, and 8). where the data are summarized by categories corresponding to the rating categories shown in table I.

As to the actual interpretation of the data: Appendix figure 48, for example, shows that there are, on the average, 2.5 days in January when burning conditions are "superior," 6+ days when these conditions are "excellent" or better, and 10+ days when they are "good" or better--all this applying to the hour of mean maximum wind.

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Another type of graph is presented for Nagasaki, which shows the way in which these conditions tend to group. Appendix figure 51 shows an average of 8.0 days in winter on which conditions are "excellent" or better at 0800 in regard to burning, but these tend to be bunched; i.e., there is a marked tendency for good days to follow good days, and therefore the simple frequency figures do not indicate even near-random occurrences. In spring, however, the spacing between occurrences is greater and the simple frequency figures can therefore be used with greater confidence--they are not simply the result of a very few sequences of good conditions which occurred in only 1 or 2 of the 5 years sampled.

Data presented in Appendix tables 6, 7, and 8 show by months the mean number of occurrences of the different categories of conditions used in the rating of burning conditions (Table 1). These data are very detailed and despite the fact that they are based on only 5 years of record, should prove useful, because they show actual synoptic frequencies for the hours specified and with regard to the factors which affect burning.

Finally, the wind velocity curves and data, presented in Appendix tables 3, 4, and 5, will provide information as to the likelihood of encountering high winds, conducive to the spread of fire, at any time of the day or night in any month.

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APPENDIX I

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Table 1.--Mean Number of Rainy Days for Selected Japanese Stations

Station \ Month	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	Years of Obs.
札幌 Sapporo	6.1	6.6	10.4	12.3	14.0	18.1	18.9	17.1	18.2	12.7	7.5	8.3	147.2	1897—1926
秋田 Akita	5.8	6.9	10.8	12.5	14.7	17.3	16.6	13.2	17.3	13.4	8.0	5.3	143.6	〃
宇都宮 Utsunomiya	6.7	7.6	12.6	14.2	15.1	17.9	13.8	17.6	17.9	14.3	8.9	6.1	156.6	〃
福島 Fukusima	14.2	12.6	13.3	11.8	11.9	14.7	16.3	15.9	17.4	13.7	12.0	15.1	169.9	〃
山形 Yamagata	22.6	19.8	16.2	13.8	13.7	13.5	15.1	13.3	16.2	16.8	17.9	23.1	205.0	〃
浜田 Hamada	21.2	18.8	15.4	14.1	12.5	14.5	13.7	11.0	15.5	14.0	16.7	21.0	191.3	〃
福 Sekai	23.3	21.2	19.9	13.7	12.0	13.3	13.1	11.1	16.3	16.1	19.2	25.5	206.7	〃
松 Matue	23.9	22.8	21.1	15.3	14.0	14.5	15.0	11.6	17.0	17.0	19.7	25.8	230.5	〃
金 Kanazawa	26.7	22.5	21.5	16.0	14.2	14.5	15.7	12.4	17.5	17.8	21.4	26.9	227.3	〃
伏木 Hatiki	25.9	21.3	21.2	15.8	13.9	14.0	13.0	12.5	16.9	18.1	20.7	26.8	223.5	〃
新潟 Niigata	27.6	21.5	22.0	14.9	13.7	13.6	14.6	11.7	17.5	19.8	21.6	27.0	226.8	〃
秋田 Akita	27.2	23.5	22.8	15.1	15.9	14.1	17.3	13.1	17.9	19.2	21.6	27.4	243.0	〃
山形 Yamat	27.0	22.7	21.9	14.0	13.9	12.6	14.6	11.9	17.2	19.3	21.6	27.1	233.7	〃
函館 Hakodate	21.4	17.9	18.7	11.8	13.2	12.1	14.0	12.7	16.5	15.7	19.0	21.9	194.8	〃
青森 Aomo	26.2	21.6	21.0	13.1	12.6	12.4	12.9	12.2	16.2	17.6	22.1	27.0	215.0	〃
札幌 Sapporo	21.1	18.1	19.1	12.7	13.6	12.6	11.9	13.9	16.5	17.1	19.3	23.6	197.0	〃
旭川 Asahigawa	27.4	19.1	23.2	14.5	13.8	14.1	14.1	13.7	17.0	17.6	21.1	24.7	214.4	〃
帯広 Obihiro	9.1	8.6	11.1	11.4	12.8	15.2	16.2	16.6	16.5	12.4	10.2	8.3	148.6	〃
網走 Abasiri	19.6	15.7	16.0	12.2	13.4	13.5	14.3	13.0	15.3	14.3	13.2	17.6	179.1	〃
根室 Nemuro	12.4	9.8	12.9	11.9	13.0	13.5	14.9	14.5	15.2	13.5	12.8	13.4	155.7	〃
竜飛 Tatti	10.8	10.2	12.8	13.4	13.0	13.3	12.6	14.1	15.1	13.5	9.7	9.5	156.0	1931—1936
花巻 Kanaki	19.6	13.4	19.8	21.6	13.4	13.6	13.0	13.9	16.8	14.6	14.9	14.6	204.4	1922—1926
仙台 Sendaima	9.8	10.0	14.9	12.2	12.0	15.1	10.2	9.3	13.4	11.0	10.5	13.2	137.5	1901—1926
福島 Sukima	11.4	10.6	14.1	13.2	12.5	15.0	13.0	10.5	13.1	12.5	11.5	11.4	150.8	1903—1926
酒田 Sendo	10.3	11.1	13.5	11.4	11.9	13.2	12.4	8.1	15.1	11.4	11.4	13.3	140.8	1913—1926
舘山 Kiriyama	8.6	7.4	7.2	6.3	12.7	18.1	20.2	22.3	17.4	12.4	9.2	8.1	152.0	1897—1926
富山 Toyam	5.0	5.5	6.2	7.5	10.4	15.2	16.1	18.7	10.6	4.6	3.5	4.0	107.4	〃
飯山 Iiiko	5.8	7.9	8.8	9.1	10.1	11.5	9.6	10.8	8.6	4.3	4.0	5.3	94.2	〃
高山 Takiyā	7.9	10.1	12.1	10.9	13.1	16.7	15.1	17.8	8.6	3.7	5.3	6.6	127.5	〃
高志 Takata	16.4	16.0	17.1	15.4	16.1	15.4	13.5	15.0	14.2	15.1	15.4	15.9	186.1	〃
石巻 Ingakimo	20.5	17.4	17.6	15.3	17.0	16.2	16.3	17.7	18.6	17.6	19.2	20.7	214.1	〃
新潟 Niiga	19.0	17.3	17.6	15.6	16.7	16.0	15.9	16.7	17.6	15.7	15.7	16.5	202.4	〃
佐渡 Sado	22.7	21.4	20.2	18.9	19.3	19.9	18.0	19.8	19.8	18.8	16.9	20.8	236.2	〃
長岡 Nagaoma	13.8	13.0	16.2	14.6	14.0	18.8	16.8	14.6	14.7	11.5	11.0	13.1	172.8	〃
宮崎 Miyazaki	9.0	9.4	13.9	15.0	14.5	18.5	16.6	15.7	16.5	13.0	9.4	8.1	158.5	〃
鳴本 Narumoto	12.1	11.5	13.9	12.5	12.8	16.5	15.8	12.9	13.5	12.1	9.7	11.8	152.9	〃
伏見 Fuji	12.0	12.2	13.7	13.3	11.6	15.4	14.0	11.4	12.7	9.1	10.0	12.1	148.5	〃
豊岡 Tohara	12.8	13.5	15.1	13.6	12.8	17.0	14.7	11.7	14.0	10.3	11.9	13.3	166.2	〃
姫路 Ichiba	12.1	10.8	13.1	12.2	10.8	13.9	15.3	13.2	14.1	9.4	9.7	10.1	144.7	〃
大分 Oita	16.8	14.8	17.6	13.7	12.4	15.4	14.5	12.4	17.1	11.7	12.9	16.2	170.6	〃
下関 Simonoseki	9.2	9.1	13.4	13.2	12.9	15.3	14.5	12.3	14.9	10.0	8.8	7.5	141.1	〃
広島 Hiroima	13.3	13.1	15.4	13.3	11.8	14.8	13.6	10.3	14.0	11.1	12.1	15.5	163.1	〃
松山 Matoyama	11.7	10.0	13.7	12.3	11.6	13.7	12.9	10.1	13.8	9.6	9.7	9.5	138.7	〃
岡山 Okayama	12.2	10.7	13.9	12.3	12.6	14.7	12.5	9.9	13.9	10.6	10.3	11.4	145.9	〃
多度津 Tadzu	8.5	8.8	12.7	12.3	12.2	13.9	11.7	9.0	13.5	10.0	8.5	7.8	128.8	〃
神戸 Kôbe	10.5	10.1	14.2	13.1	12.5	14.5	12.0	9.5	14.2	11.4	10.6	10.3	145.7	〃
大阪 Osaka	9.7	10.5	14.3	12.4	12.1	14.7	12.1	10.1	14.5	10.8	9.8	9.5	141.5	〃
和歌山 Wakayama	9.3	9.6	13.2	13.0	12.6	14.7	12.7	10.1	14.4	10.8	10.1	9.0	139.4	〃
徳島 Tokusima	10.8	10.9	13.7	12.8	12.9	14.7	12.0	10.0	15.1	12.6	11.1	10.3	147.1	〃
高知 Kôti	9.7	9.9	17.1	12.5	12.7	15.8	13.2	11.3	15.4	11.7	10.6	9.5	149.5	〃
津 Tu	8.3	8.8	13.0	13.8	12.7	17.3	16.7	14.7	17.2	11.2	9.6	7.4	151.9	〃
名古屋 Nagoya	9.3	10.2	13.8	13.6	10.7	15.8	14.7	14.1	16.5	12.6	10.8	8.9	154.0	〃
豊橋 Hamamatu	10.0	8.8	12.6	12.7	12.5	14.7	14.8	13.0	15.8	11.8	10.2	8.9	148.5	〃
岡崎 Nimodo	8.6	8.0	12.0	12.5	13.1	15.4	14.1	13.0	16.0	13.1	10.2	8.9	148.0	〃
横浜 Yokohama	8.1	9.2	12.7	14.6	14.9	16.5	14.8	13.1	16.5	13.9	10.5	7.9	153.0	〃
東京 Tokyo	7.7	9.2	13.8	14.0	14.3	16.6	13.8	12.5	16.2	14.1	10.5	6.9	150.0	〃
銚子 Tyôsi	10.6	8.5	12.3	13.8	14.2	16.1	14.3	13.1	16.8	14.3	10.2	6.5	148.0	〃
水戸 Mito	8.5	11.7	15.9	14.6	14.6	15.9	12.6	11.5	15.3	14.1	13.5	10.3	162.3	〃
石巻 Isinomaki	10.7	9.3	14.0	13.9	13.1	16.4	15.6	14.2	16.8	15.1	10.5	7.3	166.9	〃
宮古 Miyako	9.2	10.6	12.8	12.3	12.8	15.5	15.3	14.3	16.1	14.7	13.1	11.6	166.4	〃
八本 Yagi	11.3	9.7	11.3	10.8	12.7	13.9	15.8	15.6	16.8	13.2	9.7	9.3	147.6	〃
京都 Kyôto	13.7	11.8	14.4	13.6	12.2	15.9	14.0	11.9	15.9	12.3	11.8	11.9	159.0	〃
膳所 Ikkuse	13.5	13.2	15.9	14.1	12.4	15.7	14.4	11.9	15.7	11.8	11.5	13.0	164.2	〃
彦根 Ohe	13.1	16.7	17.7	14.0	12.4	15.2	14.7	11.8	16.7	13.3	14.8	16.2	185.0	〃
神戸 Kôbe	6.5	11.6	13.8	13.2	13.8	15.7	16.2	12.8	16.9	12.6	12.1	14.3	166.4	〃
長野 Nagano	18.9	7.0	10.4	11.8	12.8	13.8	14.8	12.9	14.3	11.6	8.2	8.6	131.0	〃
		16.8	16.0	12.5	12.7	15.2	15.2	12.6	16.2	12.7	12.0	17.5	176.9	〃

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Table 1 - (Cont'd) - Mean Number of Rainy Days for Selected Japanese Stations

地名 Station \ 月 Month	一月 Jan.	二月 Feb.	三月 Mar.	四月 Apr.	五月 May	六月 June	七月 July	八月 Aug.	九月 Sept.	十月 Oct.	十一月 Nov.	十二月 Dec.	年 Year	觀測年次 Years of Obs.
江陵 Kiangling	7.3	7.4	8.4	9.1	11.7	10.7	11.9	11.4	12.1	8.1	6.3	6.5	111.4	1912—1926
沅江 Kienkiang	6.5	5.7	7.3	8.1	10.8	12.7	10.4	10.7	12.4	8.9	7.5	4.7	119.1	1911—1925
岳陽 Yüehyang	6.8	6.2	6.5	6.0	10.1	11.6	12.9	12.2	9.1	6.2	6.1	6.0	105.7	1906—1926
常德 Tehtê	3.5	3.8	6.7	6.5	14.5	14.3	16.9	11.3	10.0	7.2	5.7	4.0	107.3	1915—1926
宜昌 Ichang	8.3	6.9	9.3	11.4	13.3	14.5	17.1	13.7	12.5	7.8	5.7	4.0	124.5	1898—1926
萬縣 Wanhsien	4.7	4.5	6.5	7.4	10.1	11.7	13.5	12.1	9.9	7.1	6.6	5.1	101.9	1916—1925
大溪 Tahsi	4.3	3.1	4.3	5.0	6.5	7.9	11.7	10.2	7.6	6.2	6.5	4.9	77.7	1916—1925
奉節 Fengkieh	3.5	3.0	5.3	5.6	9.2	10.1	12.7	11.6	8.1	6.5	5.0	2.5	77.6	1917—1925
秭歸 Tzekuei	3.6	3.2	5.4	5.8	10.0	12.1	14.9	12.4	9.1	6.5	5.0	2.5	83.2	1916—1925
巴東 Patung	5.5	5.3	5.9	7.2	10.5	14.0	15.4	12.5	11.3	8.1	6.1	5.3	91.7	1903—1925
沙市 Tzeitien	2.4	2.1	2.5	3.3	8.4	8.7	13.4	11.1	6.7	4.4	2.8	1.8	107.2	1901—1925
施南 Enshi	3.3	2.7	3.5	5.2	7.3	6.8	14.5	13.9	8.5	3.0	2.0	2.9	64.5	1913—1925
芝罘 Chefoo	7.2	5.7	4.9	5.4	6.4	7.5	12.5	11.0	7.9	5.5	7.0	5.0	79.1	1921—1925
中島 Tsungtao	2.5	2.4	4.1	3.6	7.9	8.5	13.4	11.1	7.9	3.5	4.2	4.4	87.0	1905—1925
上海 Shanghai	9.1	12.4	11.4	11.9	14.0	13.7	11.7	12.1	13.4	6.1	7.1	8.4	77.5	1918—1926
蘇口 Haikow	7.9	10.3	12.7	13.4	12.6	13.5	11.9	8.2	7.0	3.4	6.1	8.4	176.3	1922—1927
アデル Gaya	16.3	12.7	13.0	9.0	17.3	19.0	24.5	24.5	23.7	21.7	21.7	23.7	121.9	1908—1925
マニラ Manila	5.2	3.3	3.5	3.7	9.7	13.3	21.0	21.0	22.3	10.4	12.8	9.7	228.3	1897—1926
アガット Agaña	10	11	9	5	9	19	22	25	23	16	15	17	141.1	1905—1910
廈門 Amoy	6	11	14	15	15	14	10	11	8	4	6	7	131	1903—1918
北京 Peking	2.9	2.4	2.0	3.3	4.4	4.4	8.6	7.6	5.2	4.4	1.9	0.6	112	?
海參威 Vladivostok	3.3	3.8	4.1	6.6	11.4	10.4	14.4	14.3	10.2	7.4	4.6	4.3	47.7	1908—1925
ハルビン Harbin	2.5	3.0	6.0	4.3	9.0	10.5	13.0	14.0	8.3	3.9	1.7	1.3	102.9	1910—1917
長春 Hsinking	1.5	0.5	2.7	3.5	5.9	8.0	9.2	10.7	5.7	4.0	2.5	1.3	77.3	1898—1900
アムール Amoy	4.0	3.5	4.0	5.7	9.8	9.2	15.0	11.3	8.6	3.4	3.0	3.5	58.7	1910—1917
アオヤマ Aoki	1.8	2.9	2.3	2.5	6.0	7.8	9.5	10.3	6.5	4.7	2.0	2.9	87.9	1906—1907
マ ヤ Taihi	2.1	1.6	2.3	4.3	6.2	7.6	10.6	13.8	7.3	4.5	3.0	4.5	56.8	1892—1901
札幌 Sapporo	8.6	11.6	12.2	12.3	13.6	14.2	10.2	11.8	15.8	12.6	10.0	9.4	87.9	1906—1907
甲府 Masuda	9.2	10.2	11.1	13.5	16.2	16.5	17.6	13.7	14.5	11.2	8.5	8.5	244.4	1921—1951
福井 Fukuoka	8.5	10.9	12.0	14.2	14.6	15.4	14.8	15.0	17.8	11.6	12.5	10.2	152.9	1912—1935
八丈島 Hachijojima	19.9	19.4	20.9	19.0	15.3	14.8	13.9	16.1	20.6	22.4	18.9	18.9	164.9	1913—1925
父島 Titizima	16.7	15.6	15.5	15.0	14.0	11.9	14.1	17.9	16.7	15.4	16.3	16.9	226.4	1907—1925
名古屋 Nagoya	7.6	11.9	10.4	10.5	11.4	15.0	10.8	10.4	11.9	14.9	11.8	10.2	132.7	1907—1925
鹿兒島 Kagoya	9.4	12.2	13.1	15.0	15.9	16.0	15.4	12.4	13.5	10.9	11.8	10.2	141.0	1922—1936
小松 Komatsu	7.3	9.4	12.3	12.9	14.0	16.9	13.6	13.4	17.6	15.9	13.0	10.0	165.8	1919—1925
金澤 Kanazawa	23.6	21.4	19.9	13.7	15.9	17.1	18.1	16.7	14.1	14.1	17.4	22.1	183.5	1901—1925
高山 Takayama	21.1	18.4	19.0	16.9	14.3	14.7	17.1	14.3	17.3	18.7	15.4	21.4	201.9	1920—1921
松江 Izki	10.9	10.6	13.5	13.0	14.0	10.6	16.7	13.8	15.3	12.0	11.8	11.5	201.9	1923—1926
松本 Matsumoto	11.5	9.5	11.9	11.7	12.6	15.1	15.4	12.6	14.7	11.8	9.0	9.6	133.9	1894—1925
福井 Fukui	7.3	10.0	9.5	13.7	14.2	14.5	13.5	12.0	16.6	14.0	8.2	6.8	144.5	1938—1926
秩父 Tokubuchi	8.0	9.9	14.4	14.6	15.2	17.6	17.4	10.3	15.1	15.3	10.5	7.2	130.1	1921—1926
足尾 Ano	9.1	9.8	13.5	14.4	16.2	15.8	20.6	13.1	13.2	14.7	9.3	8.4	154.7	1902—1926
水沢 Mizusawa	11.3	10.5	10.2	13.8	15.4	14.4	16.9	15.0	17.0	16.0	17.6	13.8	173.1	1899—1926
豊岡 Toyooka	22.6	21.8	21.0	14.0	15.9	15.2	13.8	11.7	14.0	17.4	20.5	25.8	294.1	1896—1926
宮津 Miyadu	28.0	21.8	21.6	15.1	14.0	16.1	14.8	12.5	16.5	17.9	19.8	24.9	231.2	1918—1921
敦賀 Tsuruga	24.1	21.4	21.0	15.2	14.0	15.7	14.5	11.8	16.9	16.5	19.5	24.9	231.8	1901—1926
伊良 Mirushiki	20.8	22.8	21.8	14.4	11.8	10.8	15.0	8.8	17.0	16.6	23.0	27.0	219.3	1903—1926
宮古 Takada	20.6	22.4	20.0	15.4	13.6	14.6	15.4	11.2	14.6	19.6	23.4	26.6	237.4	1925—1936
前橋 Maebasi	27.9	21.5	21.9	14.6	13.4	13.5	13.3	9.3	14.7	15.4	21.9	26.7	232.6	1922—1926
銚子 Kosisi	27.0	20.2	22.3	14.8	13.3	11.5	17.5	12.7	16.9	19.9	24.5	27.0	238.9	1923—1926
秋田 Akita	8.9	8.1	11.3	13.2	18.1	13.4	13.5	15.0	15.1	15.7	10.7	9.2	275.5	1901—1926
仙臺 Sendai	26.5	20.3	18.0	15.0	13.1	12.4	15.7	13.2	16.2	15.9	21.7	27.7	140.0	1901—1926
大湊 Ominato	13.4	12.9	14.0	12.0	13.7	12.1	13.6	12.0	13.0	14.0	16.2	17.9	223.7	1903—1925
水戸 Mito	21.4	16.0	15.6	11.3	12.1	9.9	16.1	11.9	15.0	13.9	20.4	22.0	167.8	1906—1926
盛岡 Morioka	21.9	16.7	15.3	13.5	13.5	14.3	14.9	13.7	15.5	14.8	19.5	24.3	187.3	1920—1926
宮古 Miyako	19.6	15.9	16.6	12.8	13.9	14.7	16.5	13.1	16.5	15.6	18.2	21.9	187.3	1906—1926
新潟 Niigata	9.8	8.6	11.3	11.5	13.2	14.4	14.3	14.4	14.9	11.5	10.9	10.5	194.8	1898—1926
福島 Hukusima	6.3	5.7	8.9	9.7	9.3	13.1	14.1	13.5	11.3	7.5	6.3	5.9	147.4	1909—1926
大阪 Tokyo	5.7	4.9	8.7	8.6	9.5	11.3	13.5	11.8	10.1	5.5	6.3	4.7	106.5	1905—1926
本莊 Honjo	11.7	9.3	9.7	10.0	9.3	12.3	14.5	11.4	10.6	7.5	11.0	12.6	99.9	1906—1926
仙台 Sendai	9.8	8.9	7.9	9.6	10.3	10.1	16.5	12.6	9.3	7.4	11.1	11.8	126.9	1908—1926
仁台 Jindai	7.7	8.3	8.0	8.0	9.0	9.4	14.5	11.3	8.9	7.0	8.6	8.4	126.1	1899—1926
新潟 Niigata	7.8	6.3	7.5	8.4	9.8	10.0	16.2	13.1	9.6	6.7	8.8	8.4	104.7	1908—1926
甲府 Hukuyi	4.5	4.5	6.5	7.1	8.0	9.4	13.5	11.3	8.3	7.0	8.7	7.2	113.0	1908—1926
													102.4	1908—1926

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Table 2. - Summary of Various Climatic Conditions Pertaining to Incendiary Bombing over Japan Arranged by Target Areas

Target Area	Climatic Factors	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1. Mean wind velocity (m.p.h.)		4-18	4-13	4-13	7-13	7-13	4-9	4-13	4-11	4-11	4-13	4-18	4-18
Mean relative humidity		70-90	70-85	70-80	70-75	65-85	75-90	75-90	80-90	75-85	70-85	70-85	70-90
Mean no. of clear days		0-2	0-2	0-2	0-4	0-4	0-6	0-4	0-6	0-4	0-6	0-2	0-2
Mean hrs. bright sunshine		0-100	50-150	100-200	150-200	150-200	150-250	150-200	150-250	100-200	100-200	50-150	0-100
Average date of first snowfall: Oct. 20- Nov.10. Average date of last snowfall: Apr. 10 - May 10.													
2. Mean wind velocity (m.p.h.)		4-11	4-13	4-13	7-11	7-11	4-9	4-7	4-7	4-9	4-11	4-13	4-11
Mean relative humidity		70-80	70-85	70-80	70-85	65-90	75-95	75-95	80-95	80-90	75-85	70-75	70-85
Mean no. of clear days		0-12	0-8	0-8	2-4	0-4	0-4	0-2	0-2	0-4	2-6	0-5	0-12
Mean hrs. bright sunshine		50-200	100-200	150-250	150-250	150-250	150-250	100-250	100-250	100-200	150-200	100-200	100-200
Average date of first snowfall: Oct. 30-Nov. 10. Average date of last snowfall: Apr. 20 - May 20.													
3. Mean wind velocity (m.p.h.)		4-11	4-11	7-11	4-9	4-7	4-7	4-7	4-7	4-7	2-7	4-9	4-9
Mean relative humidity		80-85	55-80	60-75	65-80	65-75	70-90	75-95	75-95	75-90	75-85	70-85	65-90
Mean no. of clear days		0-16	0-12	0-8	2-6	0-4	0-2	0-2	0-4	0-4	2-6	0-12	0-16
Mean hrs. bright sunshine		100-250	100-250	150-250	150-250	150-250	100-250	100-200	150-250	100-200	150-250	50-250	50-200
Average date of first snowfall: Nov. 5 - Dec. 31. Average date of last snowfall: Mar. 20 - Apr. 15.													
4. Mean wind velocity (m.p.h.)		4-16	4-13	4-13	4-9	4-11	4-9	4-9	4-7	4-7	4-9	4-11	4-16
Mean relative humidity		75-96	70-85	70-80	65-80	65-80	70-85	75-85	75-85	75-85	70-85	70-90	70-85
Mean no. of clear days		0-2	0-2	0-2	0-4	0-4	0-6	0-4	2-6	0-4	4-6	0-4	0-2
Mean hrs. bright sunshine		0-100	50-100	100-200	150-250	150-250	150-250	150-250	200-250	100-200	100-200	50-150	0-100
Average date of first snowfall: Nov. 5 - Dec. 10. Average date of last snowfall: Mar. 20 - Apr. 15.													
5. Mean wind velocity (m.p.h.)		4-9	4-9	4-9	4-7	4-7	4-7	4-7	4-7	4-7	4-7	4-7	4-9
Mean relative humidity		65-85	65-80	65-80	70-80	70-85	75-85	75-85	75-85	75-85	70-85	65-85	60-85
Mean no. of clear days		0-2	0-2	0-4	2-6	2-6	0-4	0-4	2-6	0-4	2-6	2-6	0-4
Mean hrs. bright sunshine		50-150	50-150	100-200	150-250	150-250	150-200	200-150	200-300	100-200	100-200	50-250	50-150
Average date of first snowfall: Dec. 20-31. Average date of last snowfall: Mar. 5-20.													
6. Mean wind velocity (m.p.h.)		4-13	4-13	4-13	4-11	4-11	4-9	4-9	4-11	4-11	4-11	4-11	4-11
Mean relative humidity		60-80	60-75	60-75	65-80	70-85	70-90	70-95	75-90	75-85	75-85	60-80	65-75
Mean no. of clear days		2-16	0-10	2-8	2-6	0-6	0-4	0-4	0-6	0-4	2-8	2-12	2-16
Mean hrs. bright sunshine		100-250	100-200	150-250	150-250	150-250	100-200	200-300	200-300	150-250	150-200	100-250	100-250
Average date of first snowfall: Dec. 10 - Jan. 10. Average date of last snowfall: Feb. 10 - Mar. 20.													
7. Mean wind velocity (m.p.h.)		4-9	4-9	4-7	4-7	4-7	4-7	4-7	4-7	4-7	4-7	4-7	4-7
Mean relative humidity		65-75	65-75	70-80	70-80	70-85	75-85	75-85	70-85	70-85	70-80	70-80	65-80
Mean no. of clear days		2-8	2-6	2-6	2-6	2-4	0-2	0-4	0-6	0-4	2-8	2-10	2-10
Mean hrs. bright sunshine		100-200	100-200	150-250	150-250	150-300	100-200	150-300	200-300	150-200	150-250	100-200	100-200
Average date of first snowfall: Dec. 20.-Jan. 10. Average date of last snowfall: Feb. 10 - Mar. 20.													

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Table 2 - (Cont'd)- Rating of Bombing Conditions by Target Areas, Japan

Target Area	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1. Rating:	Poor	Fair	Fair	Fair	Good	Fair	Good	Good	Poor	Good	Poor	Poor
Rank:	12	7	8	6	2	5	1	4	10	3	9	11
2. Rating:	Fair	Fair	Fair	Fair	Good	Fair	Poor	Poor	Poor	Good	Poor	Poor
Rank:	7	5	6	4	1	3	10	11	12	2	8	9
3. Rating	Fair	Fair	Fair	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Fair	Fair
Rank:	4	6	5	3	7	8	9	11	12	10	1	2
4. Rating:	Poor	Poor	Poor	Fair	Good	Good	Poor	Poor	Poor	Poor	Fair	Fair
Rank:	7	6	8	3	1	2	10	9	12	11	5	4
5. Rating:	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Fair
Rank:	5	6	1	3	4	12	11	9	10	8	7	2
6. Rating:	Good	Fair	Good	Good	Fair	Poor	Poor	Good	Fair	Fair	Good	Excellent
Rank:	5	8	2	3	7	12	11	4	10	9	6	1
7. Rating:	Fair	Fair	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Fair	Poor	Poor
Rank:	3	4	2	5	9	12	10	8	11	1	7	6

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Table 3. - Diurnal Variations in Wind Velocities by Months

Tokyo

(Velocities in Miles per Hour)

Hour	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
0100	6.0	6.6	7.5	6.6	5.4	4.9	4.7	5.1	5.1	5.5	5.5	5.5
0200	6.1	6.5	7.4	6.4	5.0	4.7	4.3	4.7	5.0	5.5	5.7	5.7
0300	6.0	6.6	7.3	6.1	5.0	4.3	4.0	4.5	5.1	5.4	5.8	5.7
0400	6.0	6.5	7.4	5.8	4.7	4.3	3.8	4.1	5.0	5.5	5.3	5.3
0500	5.7	6.6	7.8	5.7	4.6	4.1	3.8	4.0	5.1	5.7	5.2	5.5
0600	5.7	6.7	7.1	6.0	5.0	4.2	4.0	4.2	5.3	5.5	4.9	5.5
0700	5.7	6.5	7.4	6.4	5.9	4.9	4.7	5.1	5.6	6.0	4.9	5.5
0800	5.8	7.6	8.4	7.7	6.6	5.4	5.0	5.8	6.5	6.7	5.5	5.7
0900	6.9	8.7	9.3	8.2	7.3	6.1	5.5	6.4	7.1	7.5	6.6	6.7
1000	7.9	9.3	9.9	8.7	7.8	6.7	6.6	7.3	7.3	7.8	7.0	7.8
1100	8.6	9.5	9.6	9.6	8.9	7.6	7.6	8.4	7.6	7.5	7.3	8.0
1200	8.9	9.4	10.3	10.1	9.6	8.1	8.6	9.1	8.2	7.7	7.1	8.3
1300	8.9	9.7	10.7	11.0	10.6	8.7	9.5	9.8	8.5	7.8	7.3	8.3
1400	9.1	9.8	10.8	11.7	11.0	9.6	9.6	10.5	8.8	7.6	7.6	8.1
1500	8.7	10.2	11.1	11.6	11.4	9.8	9.7	10.7	9.4	8.1	7.4	7.9
1600	8.2	10.2	11.5	11.7	11.0	9.9	9.9	10.8	9.2	7.6	6.8	7.4
1700	6.9	8.9	10.9	10.6	10.3	9.6	9.4	10.1	8.5	6.6	5.8	6.2
1800	6.3	7.8	9.5	9.7	9.4	9.0	8.3	9.1	7.2	6.0	5.7	5.9
1900	6.3	7.4	8.7	8.8	8.3	8.2	7.8	8.1	6.5	5.6	5.7	5.5
2000	6.4	7.5	8.2	8.6	7.6	7.6	7.0	7.3	5.8	5.4	5.3	5.7
2100	6.4	7.2	7.8	8.1	6.9	7.3	6.5	6.8	5.5	5.2	5.1	5.6
2200	6.3	6.6	7.5	7.7	6.5	6.4	6.0	6.2	5.1	5.0	5.3	5.7
2300	6.4	6.6	7.3	6.7	6.0	5.7	5.3	5.4	5.1	5.3	5.4	5.5
2400	6.2	6.4	7.4	6.3	5.5	5.2	4.8	5.1	5.0	5.4	5.3	5.5
Mean	6.9	7.9	8.8	8.3	7.5	6.8	6.5	7.0	6.6	6.3	6.0	6.4

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Table 4. - Diurnal Variations in Wind Velocities by Months

Oneka

(Velocities in Miles per Hour)

Hour	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
0100	6.5	6.2	5.5	5.3	4.5	4.3	4.1	4.2	4.3	4.3	4.9	5.2
0200	6.0	6.1	5.1	5.2	4.5	4.0	4.1	4.2	4.4	4.6	5.1	5.2
0300	5.9	6.1	5.3	5.3	4.6	4.0	4.0	4.1	4.4	4.5	5.3	5.5
0400	5.9	5.9	5.5	5.3	4.9	3.9	3.8	4.0	4.0	4.5	5.2	5.6
0500	6.0	5.6	5.5	5.2	4.7	3.9	3.6	4.0	4.2	4.4	5.1	5.5
0600	6.2	5.7	5.6	5.2	5.1	4.3	3.5	4.1	4.1	4.5	5.3	5.6
0700	5.9	5.3	5.6	5.9	5.3	4.3	3.8	4.6	4.4	4.4	5.3	5.6
0800	6.0	5.5	5.9	6.2	5.6	4.7	4.1	4.8	4.8	4.9	5.3	6.0
0900	6.3	6.3	6.4	6.6	6.1	4.9	4.8	5.1	5.1	5.3	5.7	6.1
1000	6.9	6.7	7.3	6.9	6.6	5.5	5.6	5.7	5.7	6.0	6.1	6.3
1100	7.6	7.8	7.2	7.8	7.2	6.4	6.7	6.4	6.0	6.4	6.5	7.0
1200	8.4	9.0	8.1	8.5	7.8	6.9	7.1	7.1	6.7	6.8	6.9	7.5
1300	9.1	9.8	8.8	9.0	8.3	7.5	7.8	7.7	7.4	7.2	7.4	8.1
1400	9.4	9.5	9.2	9.2	8.4	7.9	7.9	8.1	7.8	7.7	7.6	8.2
1500	9.5	9.2	9.2	9.5	8.1	8.2	8.1	8.6	8.1	8.1	8.1	7.8
1600	9.4	9.1	9.0	9.4	8.1	7.6	8.5	8.6	8.1	7.7	8.0	7.9
1700	8.5	9.0	8.7	9.0	7.9	7.5	8.5	8.6	8.1	7.1	7.2	7.4
1800	7.8	8.2	7.7	8.4	7.3	7.1	8.0	8.5	7.4	6.1	6.9	7.0
1900	7.4	7.6	7.0	7.2	6.3	6.6	7.1	7.5	6.7	5.9	6.2	6.0
2000	7.0	6.7	6.6	6.6	5.6	5.9	6.4	6.6	6.1	5.5	5.6	6.2
2100	7.3	6.1	5.9	6.3	5.5	5.3	5.8	6.1	5.5	4.9	5.3	6.0
2200	7.1	6.2	5.5	6.0	5.2	5.1	5.3	5.5	4.6	4.5	5.0	5.7
2300	6.9	6.2	5.4	5.5	4.5	4.6	4.7	5.1	4.4	4.5	4.8	5.4
2400	6.6	6.1	5.3	5.3	4.7	4.7	4.5	4.5	4.2	4.1	4.9	5.0
Mean	7.2	7.1	6.7	6.9	6.1	5.6	5.7	6.0	5.7	5.6	6.0	6.4

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Table 5. - Diurnal Variations in Wind Velocities by Months

Nagasaki

(Velocities in Miles per Hour)

Hour	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
0100	6.1	6.3	7.3	8.0	4.7	6.6	6.7	5.4	5.1	5.7	6.3	6.5
0200	6.1	6.3	7.8	7.8	4.9	6.4	6.9	5.7	5.5	5.5	6.4	5.9
0300	6.5	6.3	7.8	7.4	4.7	6.4	7.4	6.2	5.8	5.7	6.9	6.3
0400	6.6	6.2	7.6	7.4	5.1	6.4	7.3	6.3	5.9	5.3	6.3	6.7
0500	6.9	6.6	7.4	7.2	5.4	6.8	7.2	6.4	6.0	5.4	6.3	6.9
0600	7.3	6.7	7.7	7.9	5.3	6.7	7.4	6.3	6.5	5.6	6.1	6.8
0700	7.2	6.9	7.6	8.1	5.5	6.3	7.7	6.8	6.2	5.8	6.6	6.8
0800	7.9	7.3	7.6	8.5	6.3	7.0	8.7	7.5	5.8	5.7	6.4	6.4
0900	7.8	7.7	8.7	9.3	7.5	8.3	9.6	8.1	6.8	6.2	6.5	7.6
1000	8.5	8.9	9.8	9.7	7.8	9.1	10.0	8.7	8.1	7.0	8.1	9.0
1100	9.1	9.5	11.2	10.4	8.7	9.3	10.3	9.4	7.9	8.6	9.0	9.3
1200	9.8	10.2	11.2	11.3	9.3	10.0	10.5	9.6	8.7	9.2	9.1	10.4
1300	10.5	10.9	12.0	11.8	9.6	10.5	11.1	10.0	8.8	9.1	10.2	10.1
1400	10.7	11.2	12.7	11.8	9.7	10.5	11.0	9.8	8.7	9.5	9.5	10.1
1500	10.7	11.4	13.0	11.9	9.9	10.3	10.9	10.1	8.9	9.7	9.4	10.2
1600	10.6	10.8	12.7	11.4	9.6	10.0	11.0	9.9	8.7	9.4	9.0	9.6
1700	10.0	10.2	12.3	11.1	8.9	9.7	10.2	9.7	7.7	8.5	8.0	8.8
1800	8.6	9.2	11.4	9.9	7.9	9.3	9.4	8.9	6.9	6.4	6.4	7.9
1900	7.8	8.2	9.8	8.6	6.6	8.1	8.2	8.1	5.9	6.1	5.9	7.6
2000	7.3	7.6	9.5	7.7	6.0	7.4	7.0	6.8	5.6	6.0	6.3	6.9
2100	6.6	7.2	8.3	7.6	5.3	6.9	6.6	6.4	4.9	6.0	5.9	6.4
2200	6.6	6.7	7.9	7.4	4.8	6.2	6.3	5.8	5.0	5.5	6.2	6.4
2300	6.5	7.0	7.9	6.8	4.7	6.3	6.5	5.7	5.1	5.5	5.7	6.6
2400	6.4	6.8	7.9	7.1	4.5	6.4	6.4	5.8	5.2	6.0	6.2	6.3
Mean	8.0	8.2	9.5	9.0	6.8	8.0	8.5	7.6	6.7	6.8	7.2	7.7

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Table 6.--Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Tokyo

(January)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1400				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.8	0.6	0.0	0.0	0.0
	Mostly Clear	0.0	0.0	0.4	0.2	0.0
2 to 4	Mostly Cloudy	1.4	0.4	0.0	0.2	0.2
	Mostly Clear	1.6	0.4	0.2	0.4	0.0
5 or more	Mostly Cloudy	2.4	0.6	0.2	0.0	0.4
	Mostly Clear	9.2	3.2	3.4	1.6	0.4

Days with rain.....2.8

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Table 6. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table I

Tokyo

(February)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.4	0.4	0.8	0.4	0.2
	Mostly Clear	0.2	0.2	0.2	0.0	0.0
2 to 4	Mostly Cloudy	1.4	0.6	0.0	0.0	0.0
	Mostly Clear	1.4	0.6	1.0	0.0	0.0
5 or more	Mostly Cloudy	1.0	0.8	0.2	0.0	0.0
	Mostly Clear	6.2	3.0	2.2	2.0	0.4

Days with rain 4.0

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Table 6. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Tokyo

(March)

Days Since Last Rain of 0.15" or More	Sky Conditions	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 or Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.6	0.8	0.8	0.4	0.0
	Mostly Clear	0.2	0.6	0.3	0.2	0.2
2 to 4	Mostly Cloudy	0.6	1.2	1.4	0.2	0.0
	Mostly Clear	1.4	3.4	1.2	0.2	0.0
5 or more	Mostly Cloudy	1.0	0.2	0.0	0.0	0.0
	Mostly Clear	2.2	4.2	1.4	0.6	0.2

Days with rain 6.4

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Table 6. - Mean Number of Days with Conditions Related to Burning, As Shown in Key Rating Chart, Table 1

Tokyo

(April)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1400				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.4	0.4	0.6	0.0	0.0
	Mostly Clear	0.0	1.0	0.4	0.6	0.2
2 to 4	Mostly Cloudy	0.4	1.4	0.4	0.0	0.0
	Mostly Clear	0.8	1.8	2.6	0.6	0.2
5 or more	Mostly Cloudy	1.4	1.8	0.6	0.0	0.0
	Mostly Clear	1.0	4.2	2.2	1.6	0.4

Days with rain 5.0

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Table 6. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Tokyo

(May)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.6	1.6	0.2	0.0	0.0
	Mostly Clear	0.0	1.2	1.0	0.2	0.1
2 to 4	Mostly Cloudy	0.6	2.2	0.4	0.2	0.0
	Mostly Clear	0.2	4.4	1.8	0.8	0.0
5 or more	Mostly Cloudy	0.2	1.0	0.4	0.0	0.0
	Mostly Clear	0.6	2.6	2.8	0.6	0.2

Days with rain 7.0

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Table 6. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Tokyo

(June)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1600				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.8	1.6	0.6	0.2	0.0
	Mostly Clear	0.0	0.2	0.2	0.0	0.0
2 to 4	Mostly Cloudy	1.6	2.2	0.5	0.2	0.0
	Mostly Clear	0.1	2.0	2.0	0.2	0.0
5 or more	Mostly Cloudy	0.8	2.0	0.0	0.0	0.0
	Mostly Clear	1.6	4.6	2.8	0.4	0.0

Days with rain 5.8

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Table 6. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Tokyo

(July)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1600				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	1.2	1.0	0.0	0.0	0.0
	Mostly Clear	0.0	0.2	0.0	0.0	0.0
2 to 4	Mostly Cloudy	1.4	2.2	0.4	0.0	0.0
	Mostly Clear	0.6	0.4	0.6	0.0	0.0
5 or more	Mostly Cloudy	1.2	1.4	0.2	0.0	0.0
	Mostly Clear	1.6	7.8	3.0	0.6	0.2

Days with rain 5.0

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Table 6. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Tokyo

(August)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1600				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.8	0.8	0.8	0.0	0.0
	Mostly Clear	0.0	0.2	0.2	0.0	0.2
2 to 4	Mostly Cloudy	0.4	1.0	0.4	0.0	0.0
	Mostly Clear	0.0	2.0	0.8	0.2	0.0
5 or more	Mostly Cloudy	0.2	0.4	0.2	0.0	0.0
	Mostly Clear	2.4	7.8	5.8	1.2	0.0

Days with rain 5.2

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Table 6. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Tokyo

(September)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	1.2	1.0	0.2	0.0	0.0
	Mostly Clear	0.6	1.0	0.2	0.0	0.0
2 to 4	Mostly Cloudy	1.0	2.0	0.2	0.2	0.0
	Mostly Clear	1.8	2.0	0.8	0.2	0.0
5 or more	Mostly Cloudy	1.4	0.8	0.0	0.2	0.0
	Mostly Clear	1.2	4.8	0.8	0.0	0.0

Days with rain 8.4

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Table 6. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Tokyo

(October)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	2.0	1.4	0.6	0.0	0.0
	Mostly Clear	0.2	0.2	0.6	0.0	0.0
2 to 4	Mostly Cloudy	3.4	2.6	0.0	0.0	0.0
	Mostly Clear	2.0	1.4	0.4	0.0	0.0
5 or more	Mostly Cloudy	1.4	1.4	0.2	0.2	0.0
	Mostly Clear	3.2	2.0	0.6	0.0	0.0

Days with rain 7.2

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Table 6. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Tokyo

(November)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	1.2	1.0	0.2	0.0	0.2
	Mostly Clear	0.2	0.0	0.2	0.2	0.0
2 to 4	Mostly Cloudy	2.6	2.0	0.0	0.0	0.0
	Mostly Clear	1.0	1.0	0.2	0.0	0.0
5 or more	Mostly Cloudy	3.0	1.8	0.0	0.0	0.2
	Mostly Clear	5.8	2.6	1.6	0.4	0.0

Days with rain 4.6

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Table 6. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Tokyo

(December)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	2.4	0.6	0.0	0.2	0.0
	Mostly Clear	0.0	0.0	0.0	0.0	0.0
2 to 4	Mostly Cloudy	3.0	0.6	1.4	0.0	0.0
	Mostly Clear	1.4	0.6	0.2	0.4	0.0
5 or more	Mostly Cloudy	2.8	2.6	0.6	0.0	0.2
	Mostly Clear	5.8	2.6	1.4	0.4	0.4

Days with rain 3.4

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Table 7. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Osaka

(January)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.8	1.0	0.6	0.4	0.2
	Mostly Clear	0.0	0.0	0.2	0.0	0.0
2 to 4	Mostly Cloudy	2.0	0.8	1.8	0.2	0.0
	Mostly Clear	0.6	0.8	0.4	0.2	0.0
5 or more	Mostly Cloudy	1.6	1.8	0.4	0.0	0.0
	Mostly Clear	5.0	3.6	4.4	0.2	0.1

Days with rain 3.6

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Table 7. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1.

Osaka

(February)

Days Since Last Rain of 0.15" or More	Sky Conditions	Wind Velocity at 1300				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.4	1.0	0.8	0.0	0.0
	Mostly Clear	0.2	0.0	0.0	0.4	0.0
2 to 4	Mostly Cloudy	1.6	1.2	0.4	0.2	0.0
	Mostly Clear	0.4	1.0	0.8	0.0	0.0
5 or more	Mostly Cloudy	1.8	0.4	0.0	0.0	0.0
	Mostly Clear	3.6	4.0	4.8	1.0	0.0

Days with rain 4.2

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Table 7. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1.

Osaka

(March)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1400				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	1.4	1.0	0.4	0.0	0.0
	Mostly Clear	0.4	1.2	0.2	0.0	0.0
2 to 4	Mostly Cloudy	1.0	0.8	1.0	0.2	0.0
	Mostly Clear	2.6	2.4	2.0	0.0	0.0
5 or more	Mostly Cloudy	0.6	0.4	0.4	0.0	0.0
	Mostly Clear	4.0	4.8	1.2	0.0	0.0

Days with rain 16.6

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Table 7. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Osaka

(April)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.4	0.6	0.6	0.4	0.0
	Mostly Clear	1.0	1.6	0.0	0.0	0.0
2 to 4	Mostly Cloudy	0.8	1.2	0.4	0.0	0.0
	Mostly Clear	3.4	3.2	2.2	0.4	0.0
5 or more	Mostly Cloudy	0.8	0.4	0.2	0.0	0.0
	Mostly Clear	2.6	3.0	1.2	0.4	0.0

Days with rain 5.2

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Table 7. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Osaka

(May)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1400				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.8	0.8	0.4	0.0	0.0
	Mostly Clear	0.4	0.8	1.0	0.0	0.0
2 to 4	Mostly Cloudy	1.4	1.0	0.0	0.0	0.0
	Mostly Clear	3.2	2.6	1.2	0.0	0.0
5 or more	Mostly Cloudy	1.2	0.4	0.4	0.0	0.0
	Mostly Clear	4.2	4.0	1.8	0.0	0.0

Days with rain 5.4

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Table 7. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Osaka

(June)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.8	0.0	0.2	0.0	0.0
	Mostly Clear	1.0	0.4	0.2	0.0	0.0
2 to 4	Mostly Cloudy	1.0	1.0	0.0	0.0	0.0
	Mostly Clear	2.2	1.2	0.6	0.0	0.0
5 or more	Mostly Cloudy	1.0	0.8	0.2	0.0	0.0
	Mostly Clear	5.8	5.4	1.8	0.2	0.0

Days with rain 6.2

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Table 7. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Osaka

(July)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1600				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	2.0	0.4	0.0	0.0	0.0
	Mostly Clear	0.8	0.8	0.6	0.0	0.0
2 to 4	Mostly Cloudy	1.6	1.0	0.4	0.2	0.0
	Mostly Clear	0.8	2.4	0.4	0.0	0.0
5 or more	Mostly Cloudy	0.0	0.2	0.2	0.0	0.0
	Mostly Clear	2.4	6.4	2.8	0.2	0.0
Days with rain 7.4						

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Table 7. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Osaka

(August)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.6	0.4	0.0	0.0	0.0
	Mostly Clear	1.0	0.6	0.2	0.0	0.0
2 to 4	Mostly Cloudy	0.2	0.6	0.0	0.2	0.0
	Mostly Clear	2.8	2.0	1.0	0.0	0.0
5 or more	Mostly Cloudy	0.8	0.6	0.0	0.0	0.0
	Mostly Clear	4.8	8.0	3.2	0.2	0.0

Days with rain 3.8

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Table 7. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Osaka

(September)

Days Since Last Rain of 0.15" or More	Sky Conditions	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	1.4	1.0	0.2	0.0	0.0
	Mostly Clear	1.2	0.4	0.4	0.0	0.0
2 to 4	Mostly Cloudy	2.0	0.8	0.6	0.0	0.0
	Mostly Clear	2.0	1.8	0.4	0.0	0.0
5 or more	Mostly Cloudy	0.6	1.0	0.0	0.0	0.0
	Mostly Clear	3.0	4.2	2.0	0.0	0.0

Days with rain 7.0

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Table 7. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Osaka

(October)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.8	1.6	0.8	0.0	0.0
	Mostly Clear	0.2	0.2	0.2	0.0	0.0
2 to 4	Mostly Cloudy	1.8	1.8	1.0	0.0	0.0
	Mostly Clear	1.6	2.8	0.4	0.0	0.0
5 or more	Mostly Cloudy	1.4	0.4	0.0	0.0	0.0
	Mostly Clear	5.6 *	4.4	0.4	0.0	0.0

Days with rain 5.6

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Table 7. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Osaka

(November)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	1.2	0.6	0.6	0.2	0.0
	Mostly Clear	0.0	0.4	0.2	0.2	0.0
2 to 4	Mostly Cloudy	2.6	1.0	0.8	0.0	0.0
	Mostly Clear	1.4	1.0	0.8	0.0	0.0
5 or more	Mostly Cloudy	2.2	1.0	0.4	0.2	0.0
	Mostly Clear	4.8	3.6	1.8	0.0	0.0

Days with rain 5.0

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Table 7. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Osaka

(December)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1400				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	1.0	1.2	0.4	0.4	0.0
	Mostly Clear	0.0	0.2	0.0	0.0	0.0
2 to 4	Mostly Cloudy	3.4	1.4	0.4	0.4	0.0
	Mostly Clear	1.0	0.8	1.2	0.4	0.0
5 or more	Mostly Cloudy	4.6	3.0	0.4	0.4	0.2
	Mostly Clear	3.2	2.6	0.6	0.0	0.0

Days with rain 3.6

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Table 8. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Nagasaki

(January)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1400				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	1.0	0.8	0.8	0.8	0.0
	Mostly Clear	0.2	0.2	0.0	0.0	0.0
2 to 4	Mostly Cloudy	2.2	2.2	2.0	0.6	0.0
	Mostly Clear	0.8	1.0	0.2	0.0	0.0
5 or more	Mostly Cloudy	2.0	2.6	1.4	1.0	0.0
	Mostly Clear	1.8	3.0	1.6	0.2	0.0

Days with rain 4.6

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Table 8. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Nagasaki

(February)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.4	1.4	0.4	0.4	0.0
	Mostly Clear	0.4	0.6	0.0	0.0	0.2
2 to 4	Mostly Cloudy	1.4	1.0	2.2	0.2	0.2
	Mostly Clear	1.0	0.6	0.4	0.0	0.0
5 or more	Mostly Cloudy	0.2	1.8	1.8	0.6	0.0
	Mostly Clear	1.2	3.2	1.2	1.0	0.4

Days with rain 5.0

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Table 8. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Nagasaki

(March)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.4	1.0	0.8	1.0	0.0
	Mostly Clear	0.0	0.2	0.2	0.4	0.0
2 to 4	Mostly Cloudy	1.6	0.8	1.0	0.0	0.4
	Mostly Clear	1.2	2.4	0.6	0.6	0.0
5 or more	Mostly Cloudy	0.0	0.2	0.4	0.0	0.0
	Mostly Clear	2.0	5.0	3.4	1.4	0.2

Days with rain 5.8

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Table 8. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Nagasaki

(April)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8- 12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.8	0.8	0.2	0.6	0.0
	Mostly Clear	1.0	0.8	0.4	0.2	0.2
2 to 4	Mostly Cloudy	0.8	0.6	0.4	0.0	0.2
	Mostly Clear	2.2	3.2	1.8	1.6	0.0
5 or more	Mostly Cloudy	0.2	0.2	0.0	0.0	0.0
	Mostly Clear	1.2	2.2	2.2	0.2	0.6

Days with rain 7.4

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Table 8. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Nagasaki

(May)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.8	0.8	0.6	0.2	0.0
	Mostly Clear	0.4	1.0	0.2	0.4	0.0
2 to 4	Mostly Cloudy	1.4	0.2	0.8	0.0	0.0
	Mostly Clear	2.2	4.8	1.6	0.4	0.0
5 or more	Mostly Cloudy	0.8	0.6	0.2	0.0	0.0
	Mostly Clear	1.8	5.6	0.8	0.4	0.2

Days with rain 4.8

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Table 8. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Nagasaki

(June)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1300				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.6	1.6	0.2	0.4	0.4
	Mostly Clear	0.2	0.8	0.2	0.0	0.0
2 to 4	Mostly Cloudy	1.2	1.8	0.4	0.4	0.0
	Mostly Clear	1.4	2.0	0.8	0.0	0.0
5 or more	Mostly Cloudy	0.2	0.2	0.4	0.2	0.0
	Mostly Clear	1.6	5.6	0.2	0.0	0.0

Days with rain 9.2

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Table 8. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Nagasaki

(July)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1300				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.4	0.6	0.4	0.4	0.4
	Mostly Clear	0.6	0.8	0.2	0.0	0.0
2 to 4	Mostly Cloudy	1.0	0.4	0.6	0.0	0.0
	Mostly Clear	1.6	3.4	0.6	0.0	0.0
5 or more	Mostly Cloudy	0.2	0.4	0.4	0.0	0.0
	Mostly Clear	2.4	6.2	1.4	0.0	0.0

Days with rain 8.6

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Table 8. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Nagasaki

(August)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.4	0.4	0.6	0.0	0.0
	Mostly Clear	0.6	0.8	0.0	0.4	0.0
2 to 4	Mostly Cloudy	0.6	0.4	0.2	0.2	0.0
	Mostly Clear	1.2	3.8	0.0	0.0	0.0
5 or more	Mostly Cloudy	0.0	1.0	0.2	0.0	0.0
	Mostly Clear	3.6	7.2	1.4	0.4	0.0

Days with rain 7.6

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Table 8. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Nagasaki

(September)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or more
1	Mostly Cloudy	1.4	1.0	0.2	0.0	0.0
	Mostly Clear	1.0	1.2	0.0	0.2	0.0
2 to 4	Mostly Cloudy	1.8	1.4	0.2	0.2	0.0
	Mostly Clear	3.0	2.2	0.8	0.0	0.0
5 or more	Mostly Cloudy	1.0	0.4	0.4	0.2	0.0
	Mostly Clear	1.8	3.0	1.2	0.4	0.0

Days with rain 7.0

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Table 8. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Nagasaki

(October)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	0.4	0.0	0.2	0.4	0.0
	Mostly Clear	0.2	0.6	0.2	0.0	0.0
2 to 4	Mostly Cloudy	0.8	0.4	0.4	0.4	0.0
	Mostly Clear	2.2	1.0	0.4	0.4	0.0
5 or more	Mostly Cloudy	0.8	0.2	0.6	0.0	0.0
	Mostly Clear	6.8	7.8	3.0	1.2	0.0

Days with rain 2.6

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Table 8. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Nagasaki

(November)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1300				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	1.0	0.8	1.0	0.2	0.2
	Mostly Clear	0.2	0.6	0.2	0.0	0.0
2 to 4	Mostly Cloudy	1.8	0.6	1.2	0.4	0.2
	Mostly Clear	1.8	2.6	0.2	0.0	0.0
5 or more	Mostly Cloudy	1.0	0.4	0.8	0.0	0.0
	Mostly Clear	3.2	4.0	1.0	0.4	0.0

Days with rain 6.2

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Table 8. - Mean Number of Days with Conditions Related to Burning, as Shown in Key Rating Chart, Table 1

Nagasaki

(December)

Days Since Last Rain of 0.15" or More	Sky Condition	Wind Velocity at 1500				
		0-2	3	Beaufort 4	5	6 and Over
		0-7	8-12	M.P.H. 13-18	19-24	25 or More
1	Mostly Cloudy	1.4	1.2	1.0	0.6	0.2
	Mostly Clear	0.4	0.2	0.0	0.0	0.0
2 to 4	Mostly Cloudy	2.6	1.8	2.0	0.4	0.0
	Mostly Clear	0.8	1.2	0.4	0.0	0.0
5 or more	Mostly Cloudy	1.2	2.0	0.8	0.2	0.0
	Mostly Clear	2.2	2.8	1.4	0.2	0.0

Days with rain 6.0

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Figure 1. -- Base Map of Region



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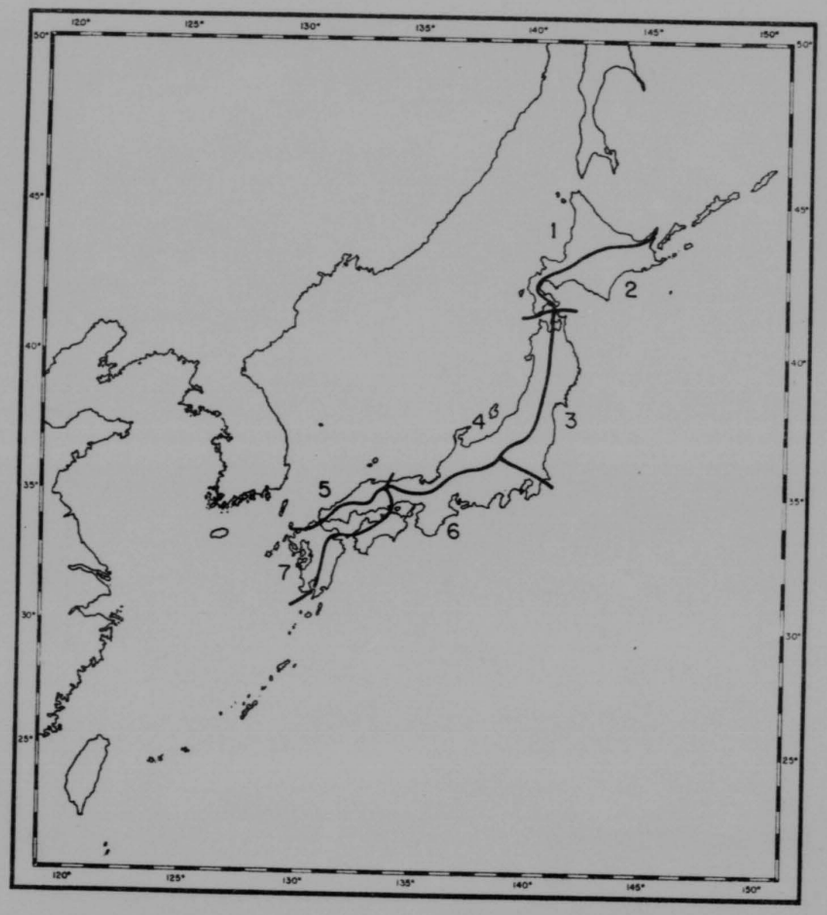
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Figure 2. -- Target Area Map of Japan



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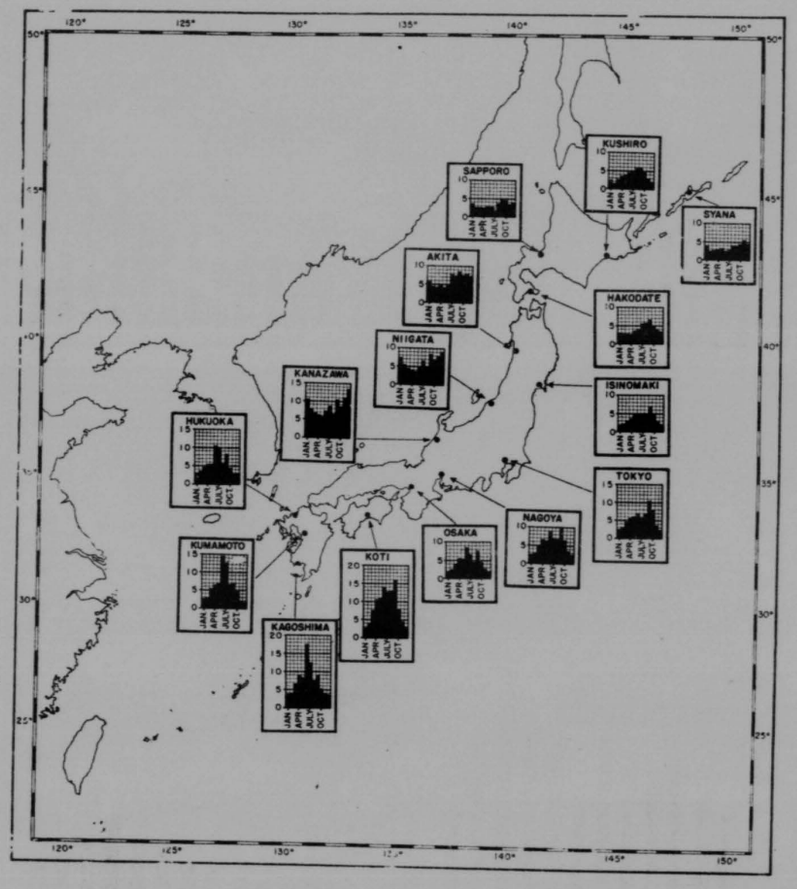
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Figure 3. -- Mean Monthly Precipitation, Japan



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Figure 4. -- Precipitation Graph

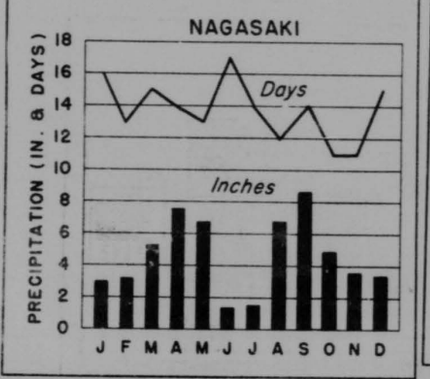


Figure 5. -- Precipitation Graph

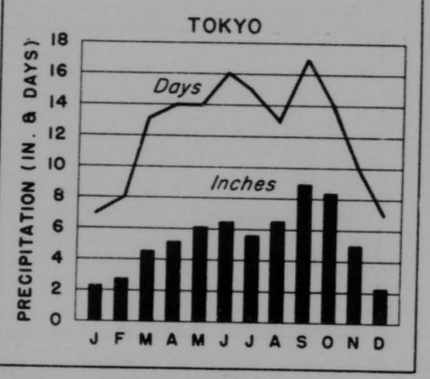


Figure 6. -- Precipitation Graph

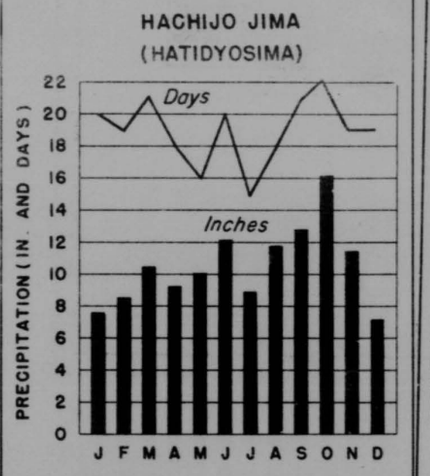
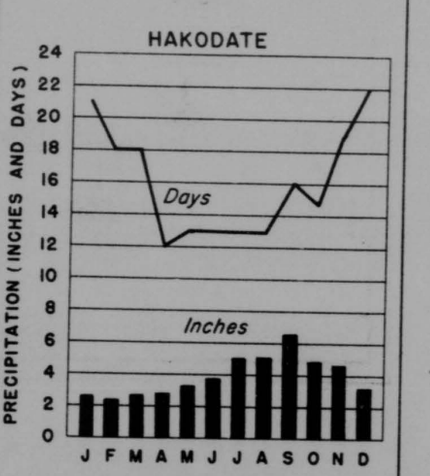


Figure 7. -- Precipitation Graph



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Figure 8. -- Precipitation Graph

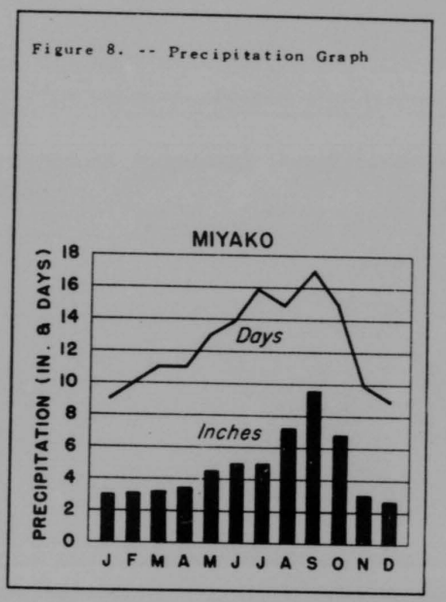
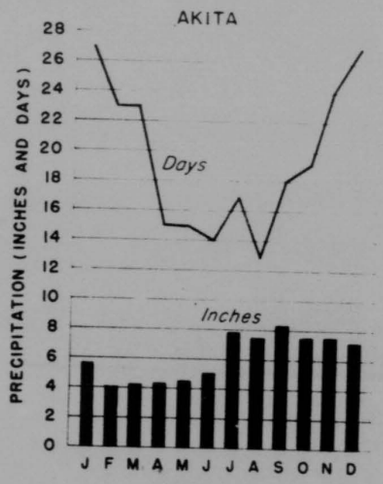


Fig. 9.--Precipitation Graph



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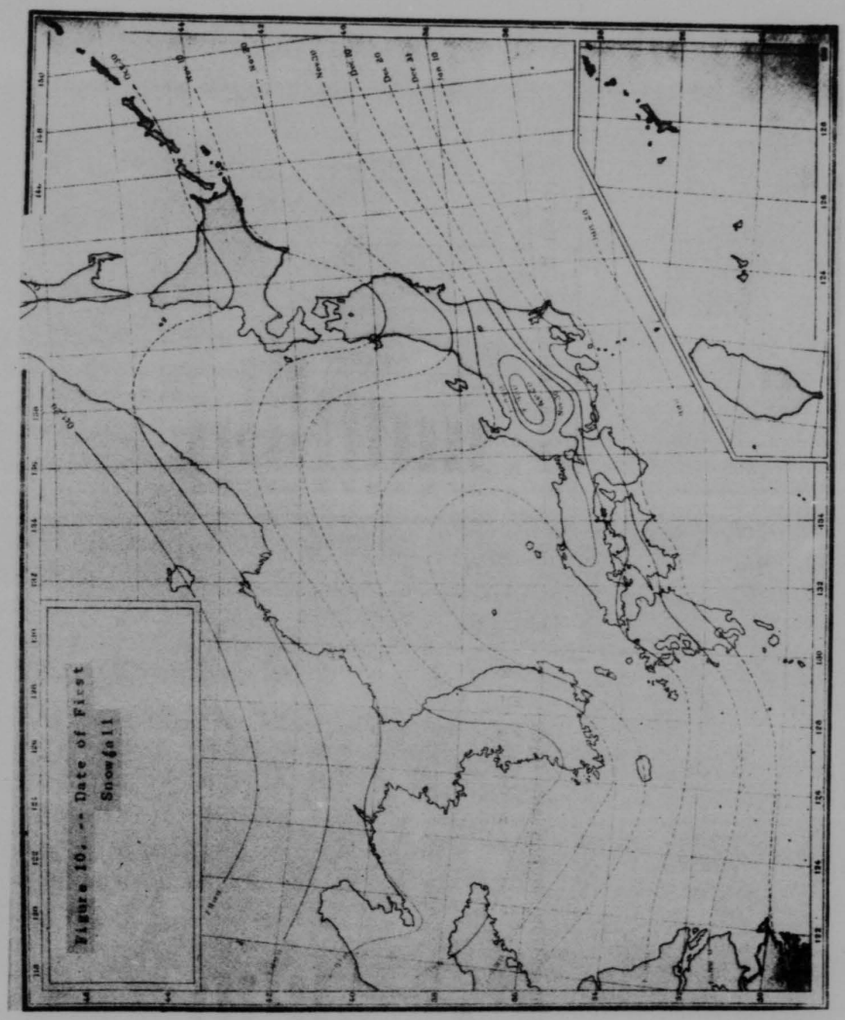


Figure 10. -- Date of First Snowfall

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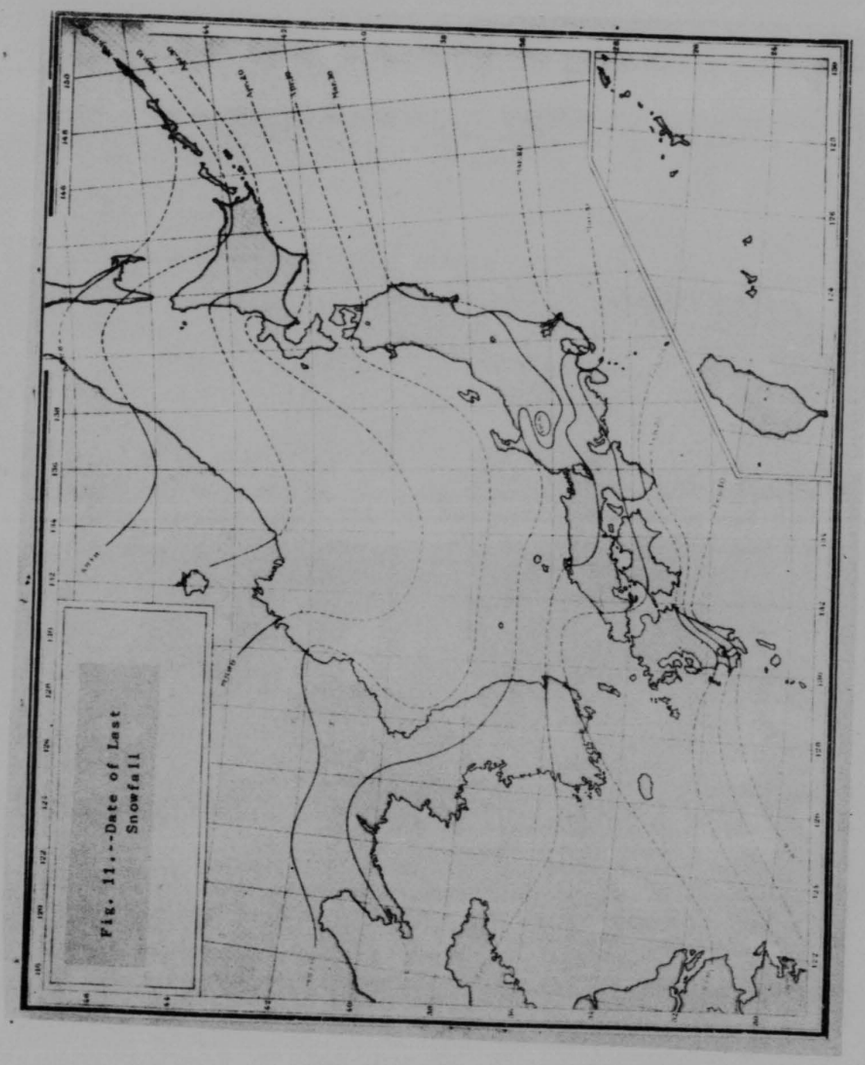


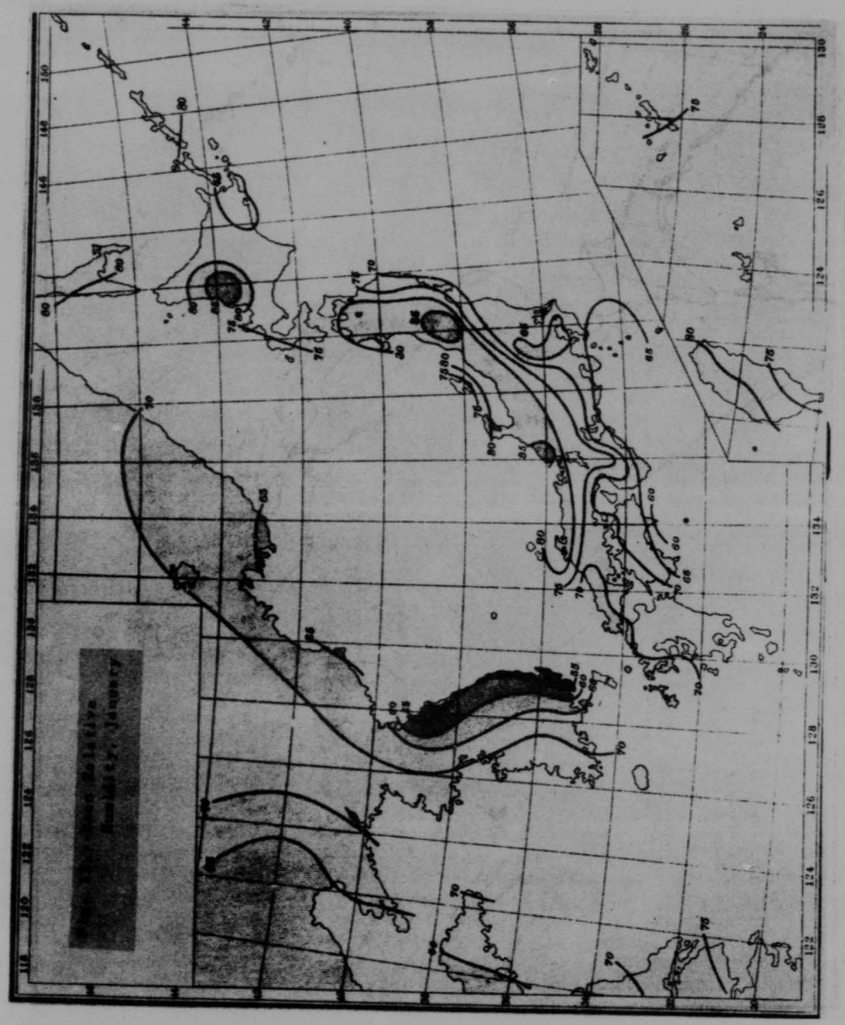
Fig. 11.--Date of Last Snowfall

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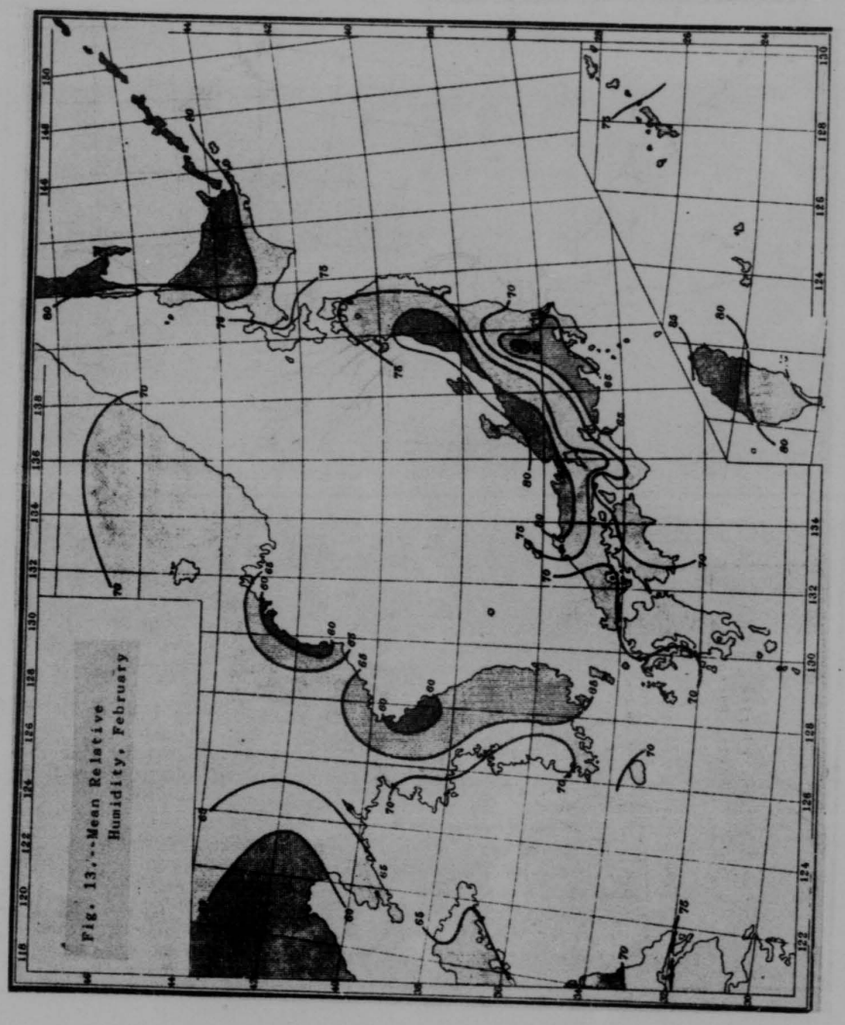


Fig. 13.--Mean Relative Humidity, February

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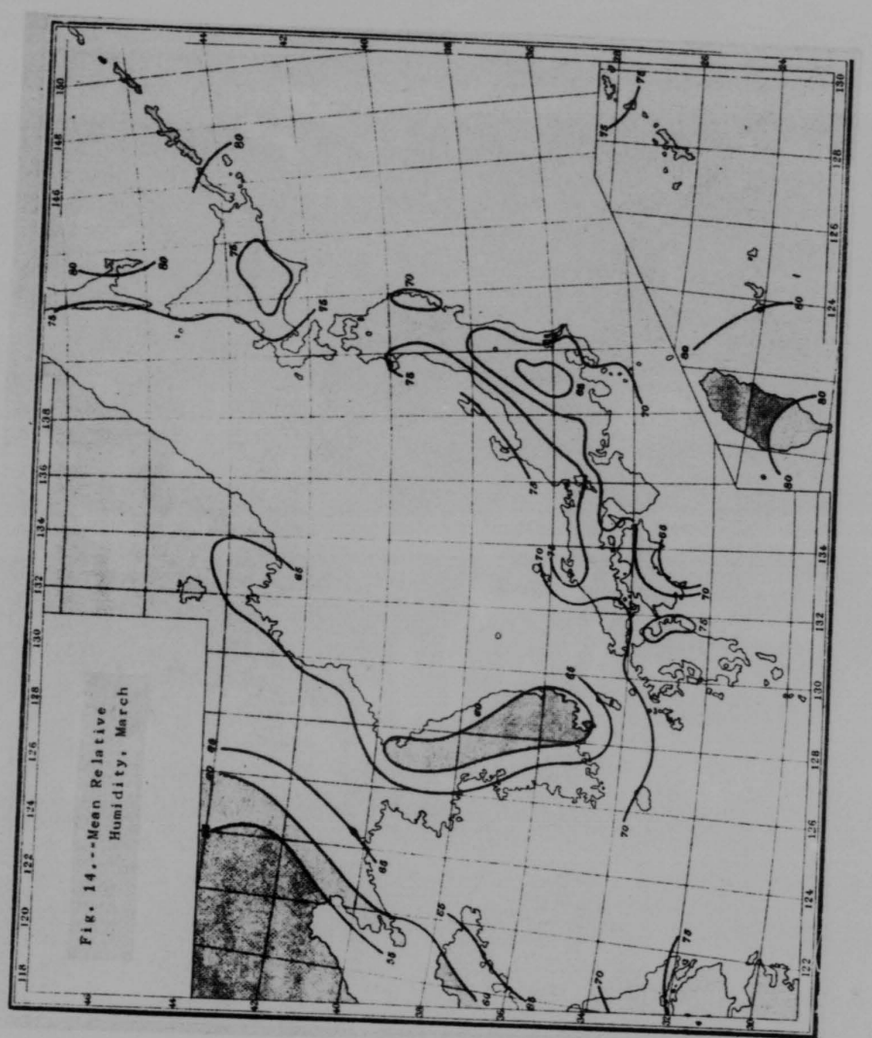


Fig. 14.--Mean Relative Humidity, March

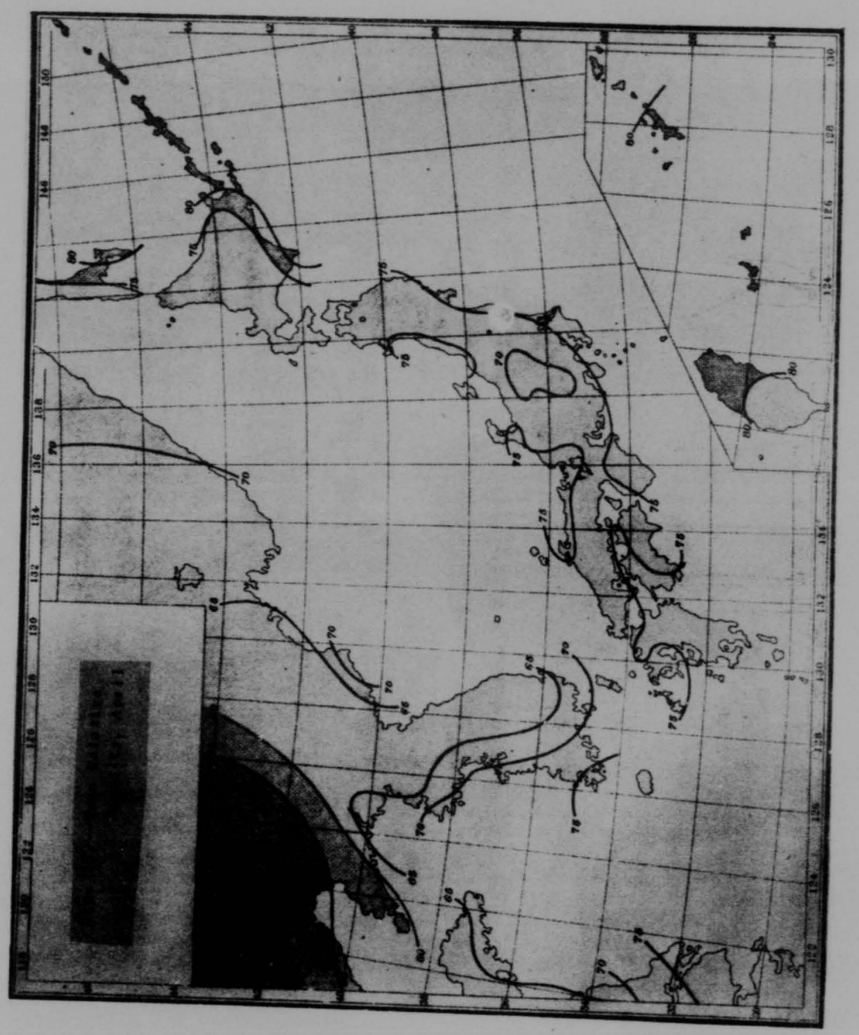
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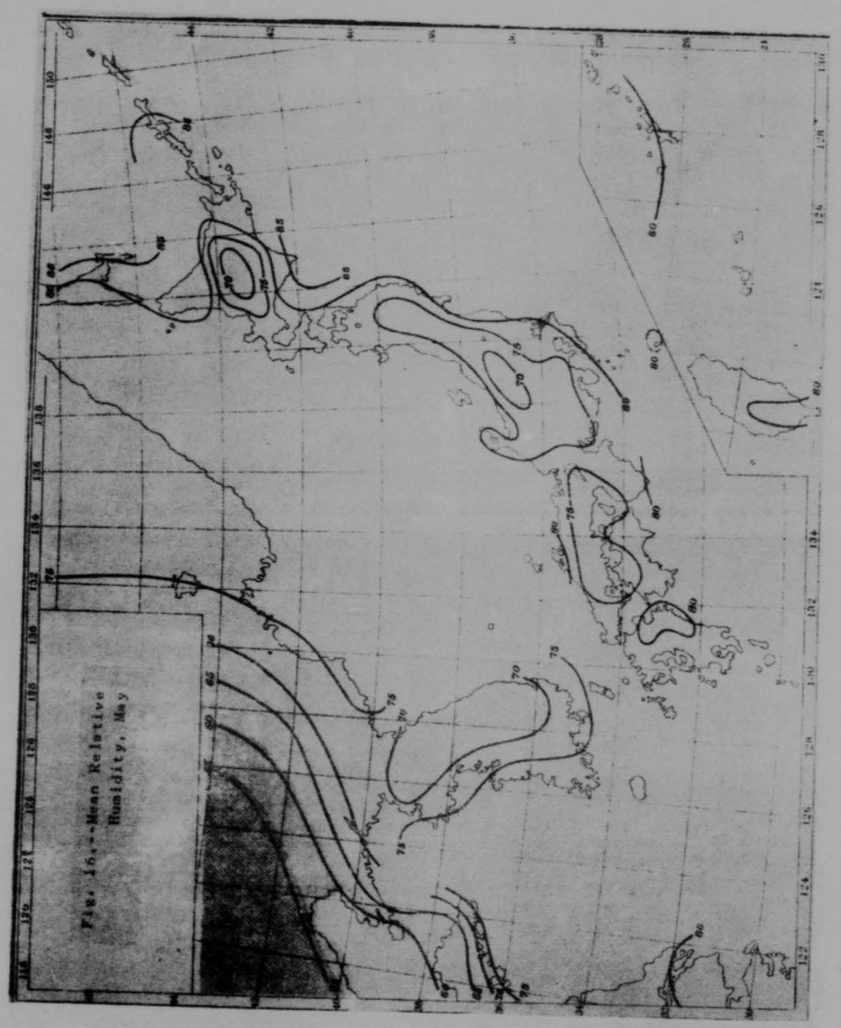
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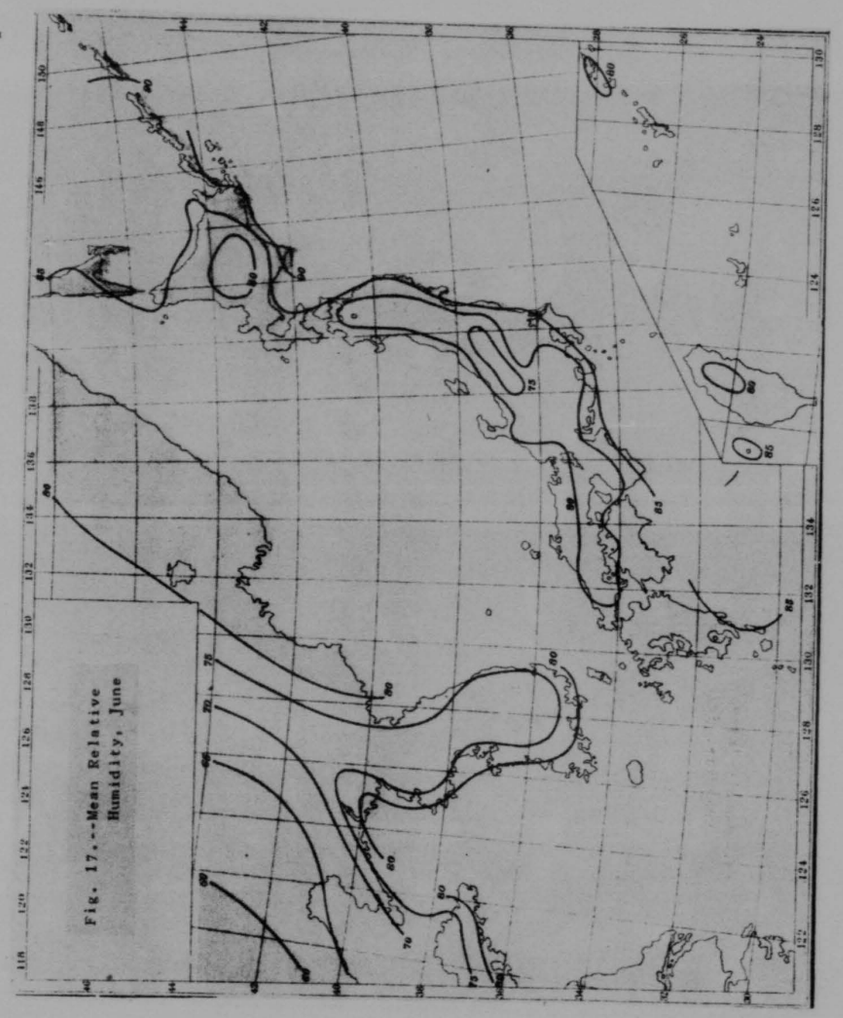


Fig. 17.--Mean Relative Humidity, June

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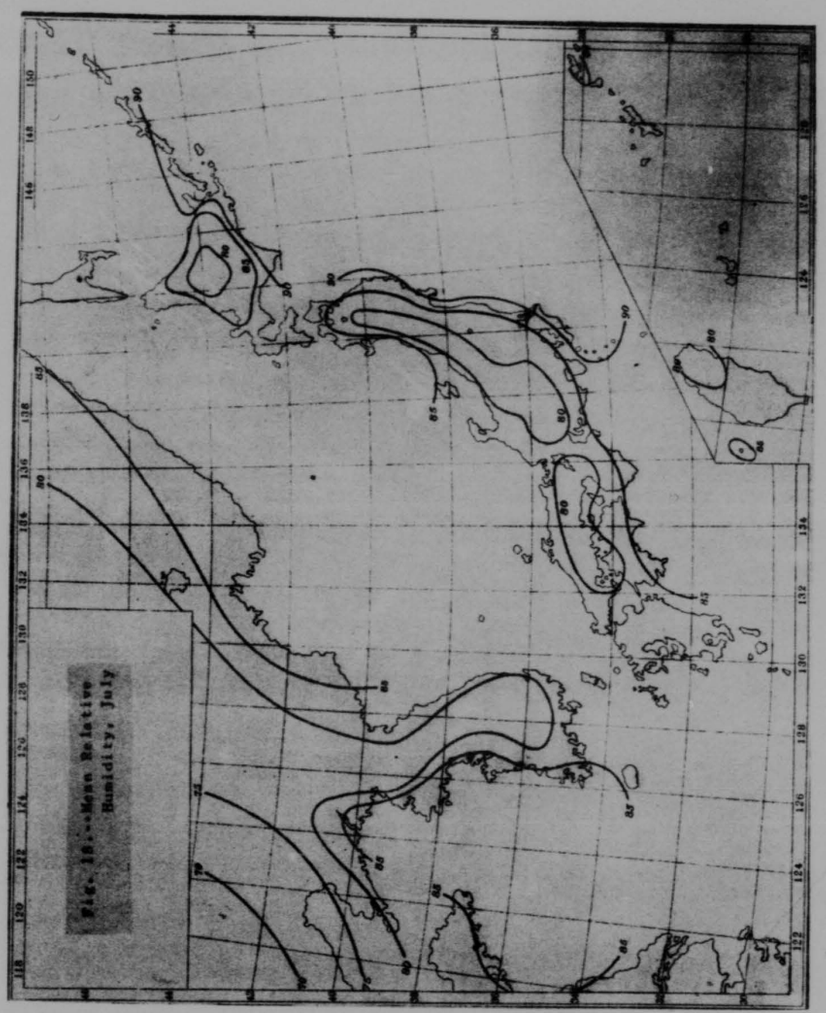


Fig. 18.--Mean Relative Humidity, July

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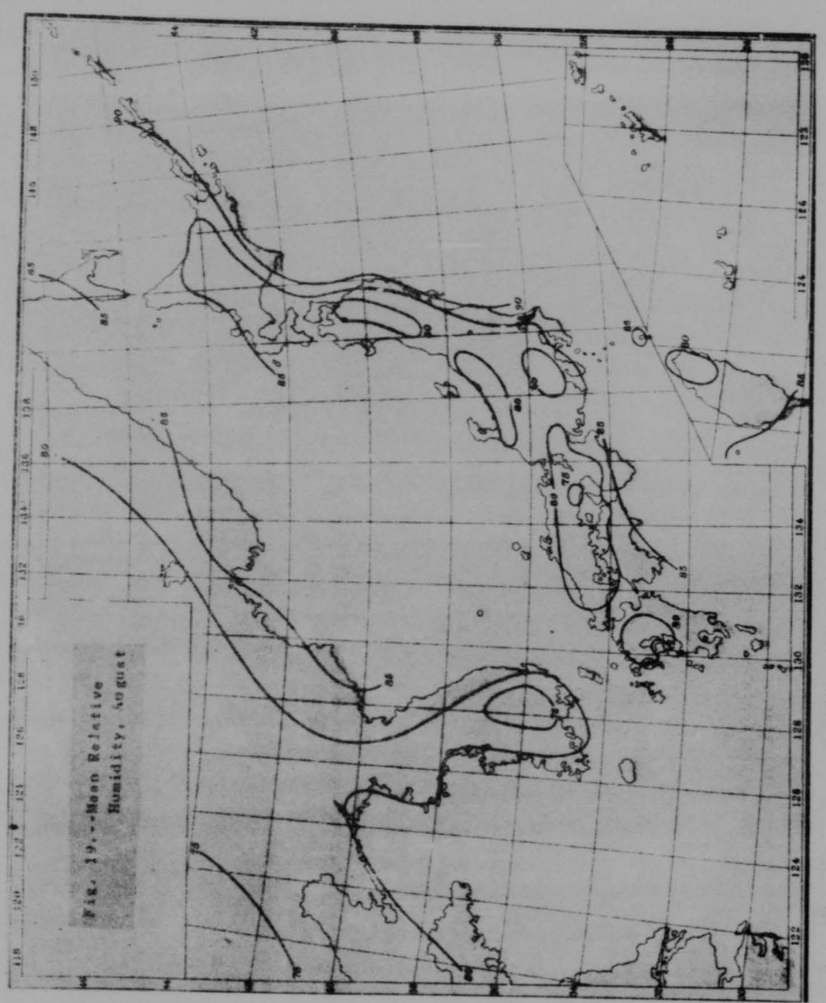


Fig. 19.--Mean Relative Humidity, August

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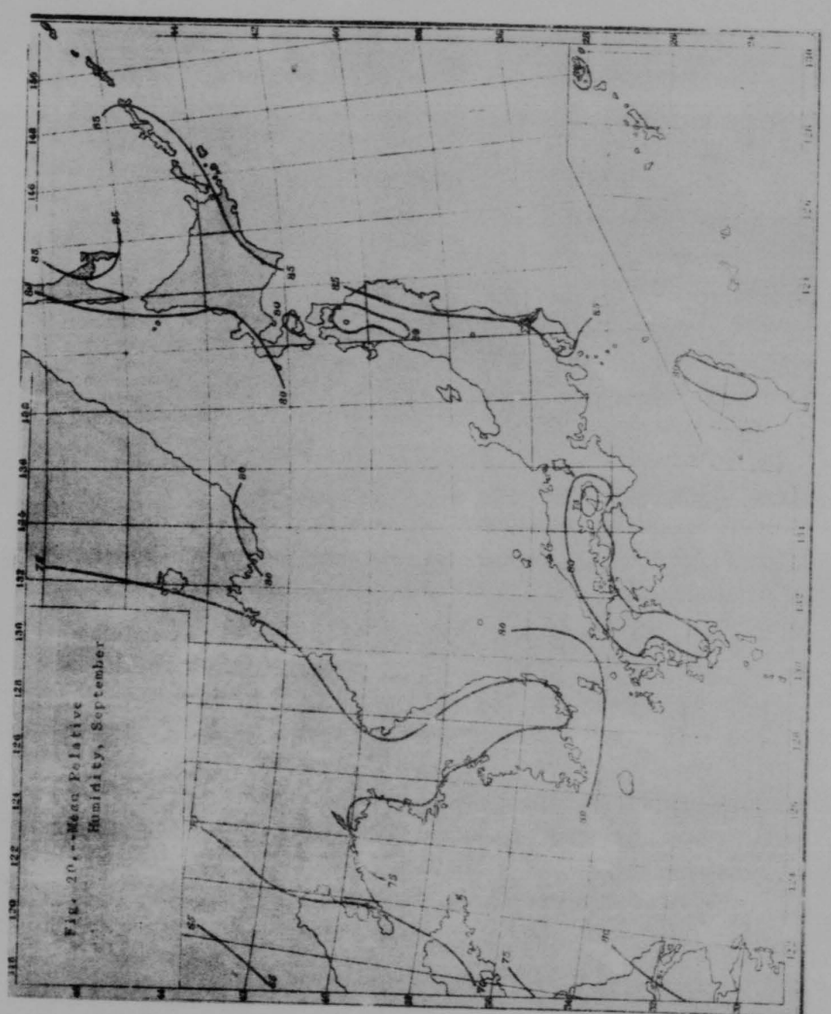


Fig. 20.--Mean Relative Humidity, September

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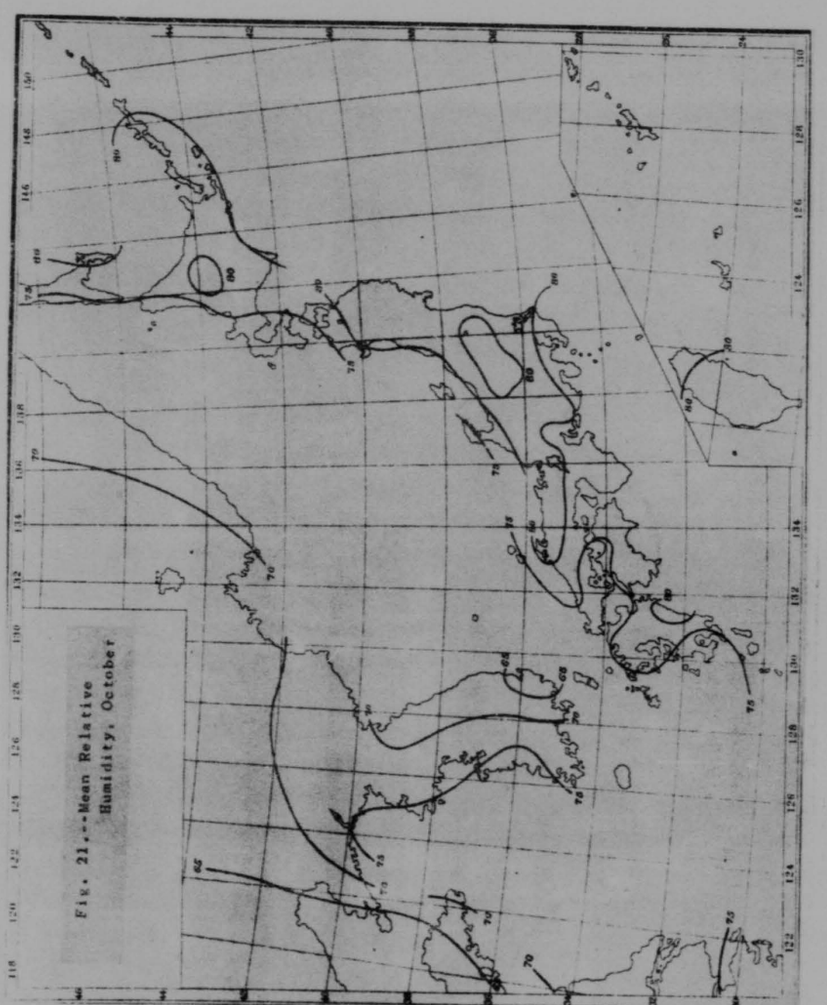


Fig. 21.--Mean Relative Humidity, October

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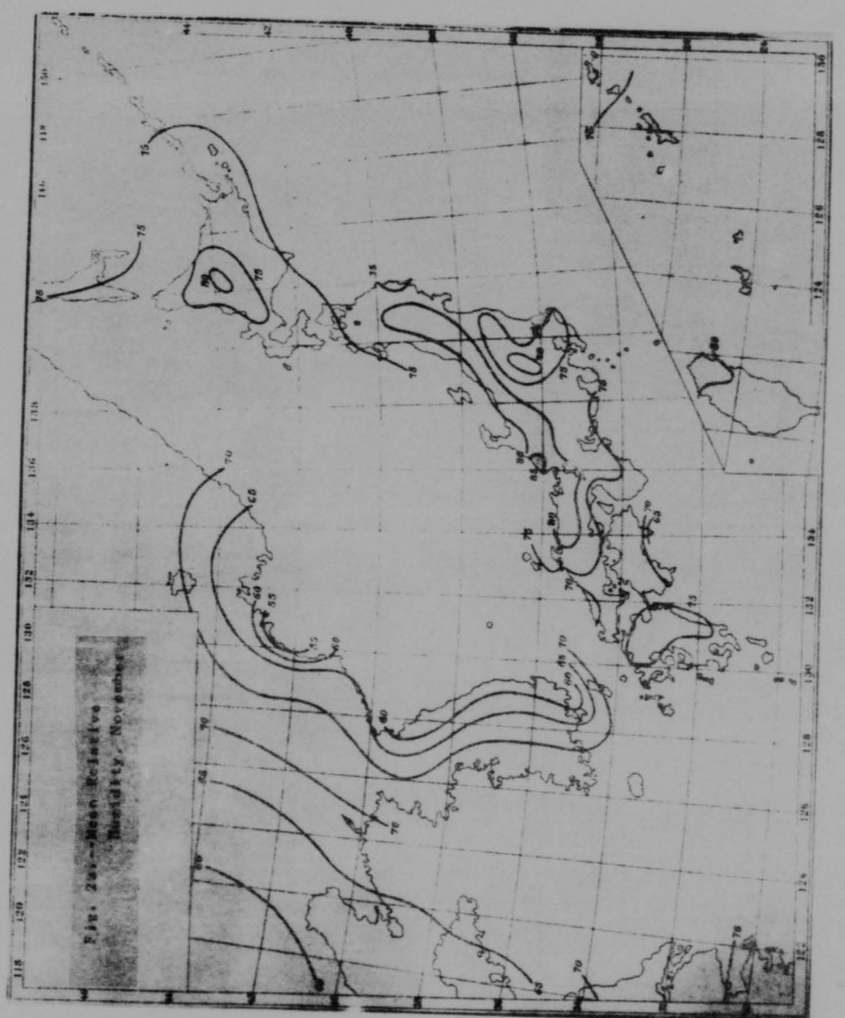


Fig. 2a.--Mean Relative Humidity, November

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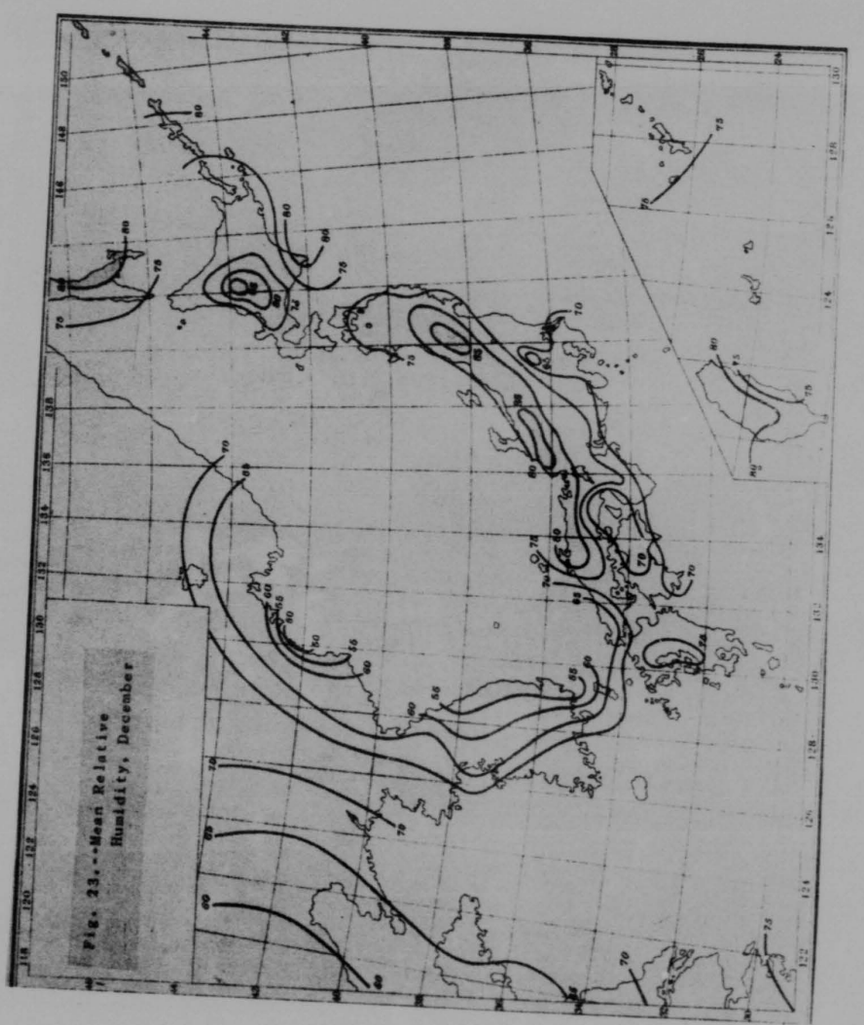


Fig. 33.--Mean Relative Humidity, December

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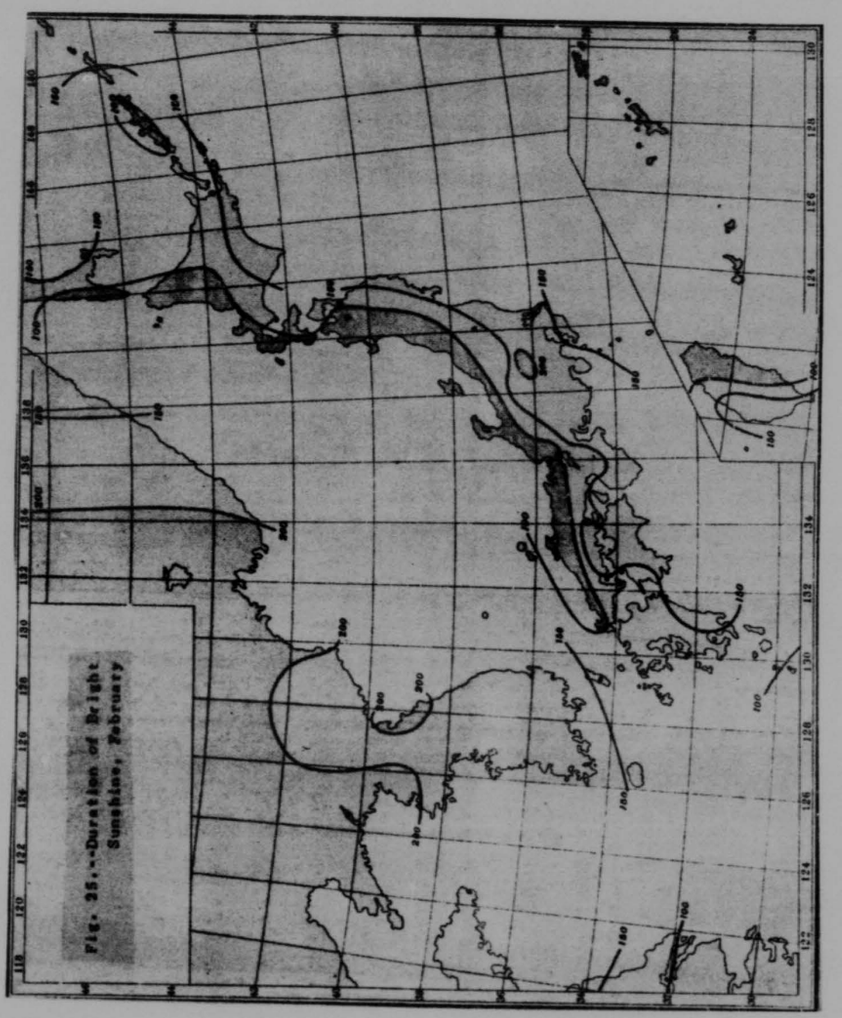


Fig. 35.--Duration of Bright Sunshine, February

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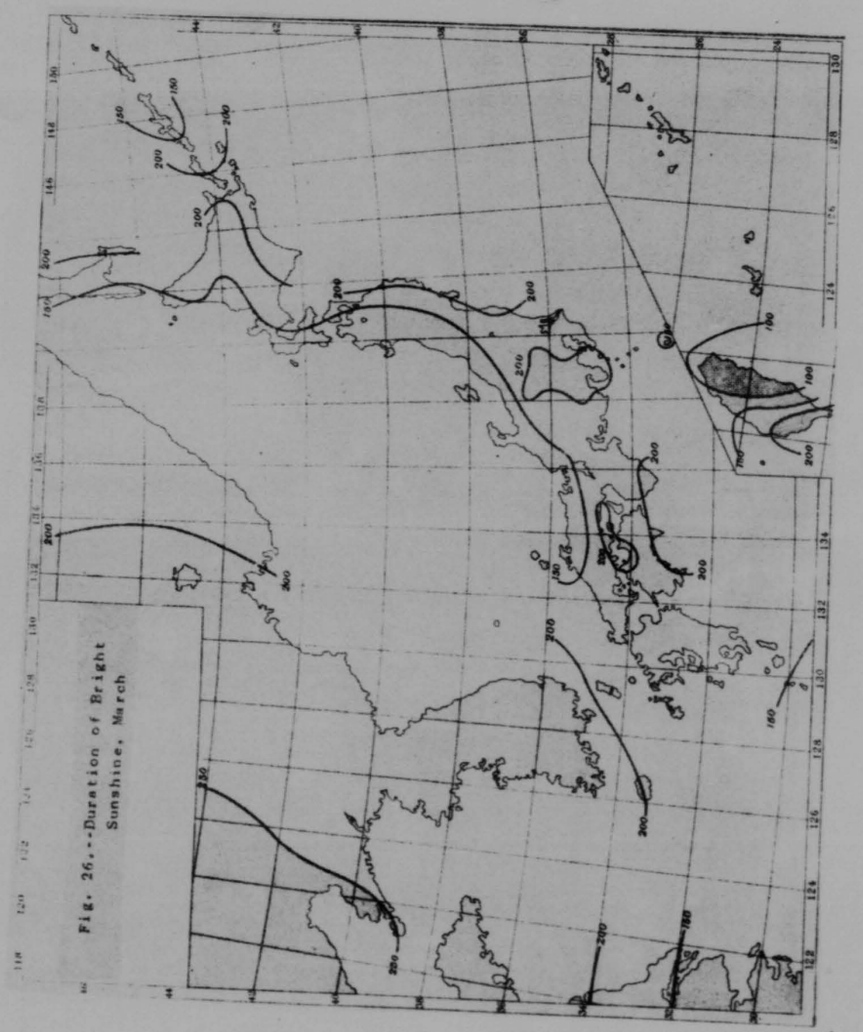


Fig. 26.--Duration of Bright Sunshine, March

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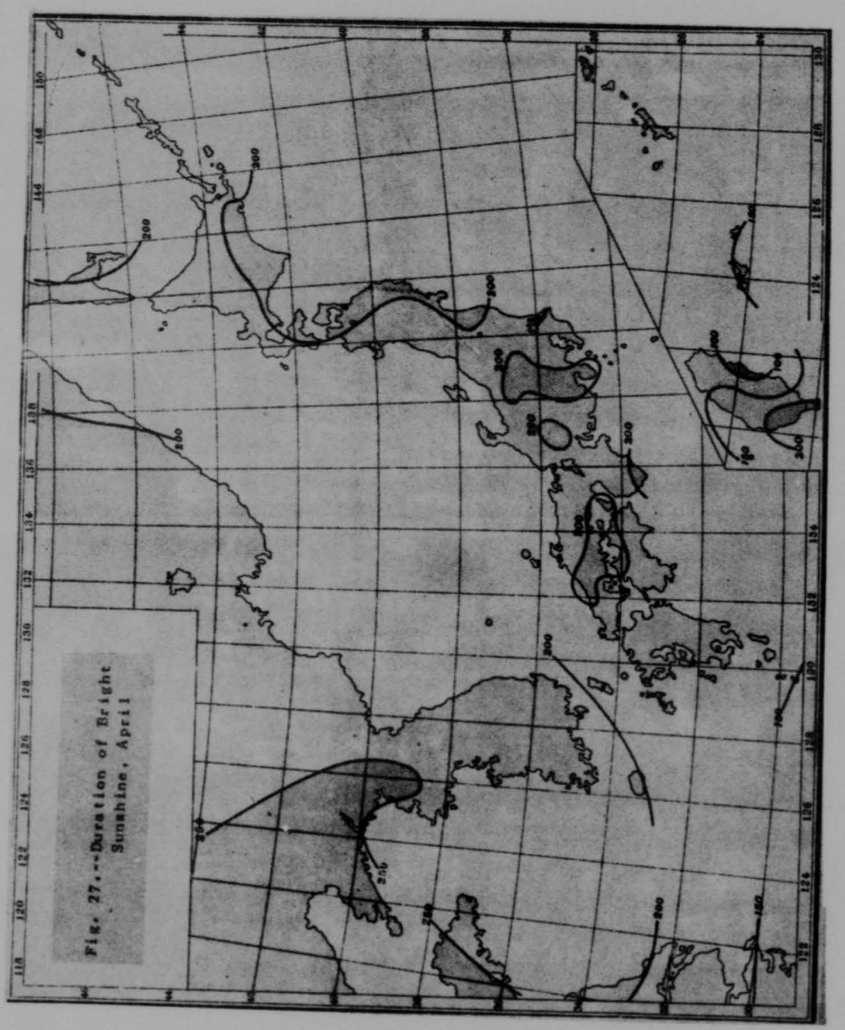


Fig. 27.--Duration of Bright Sunshine, April

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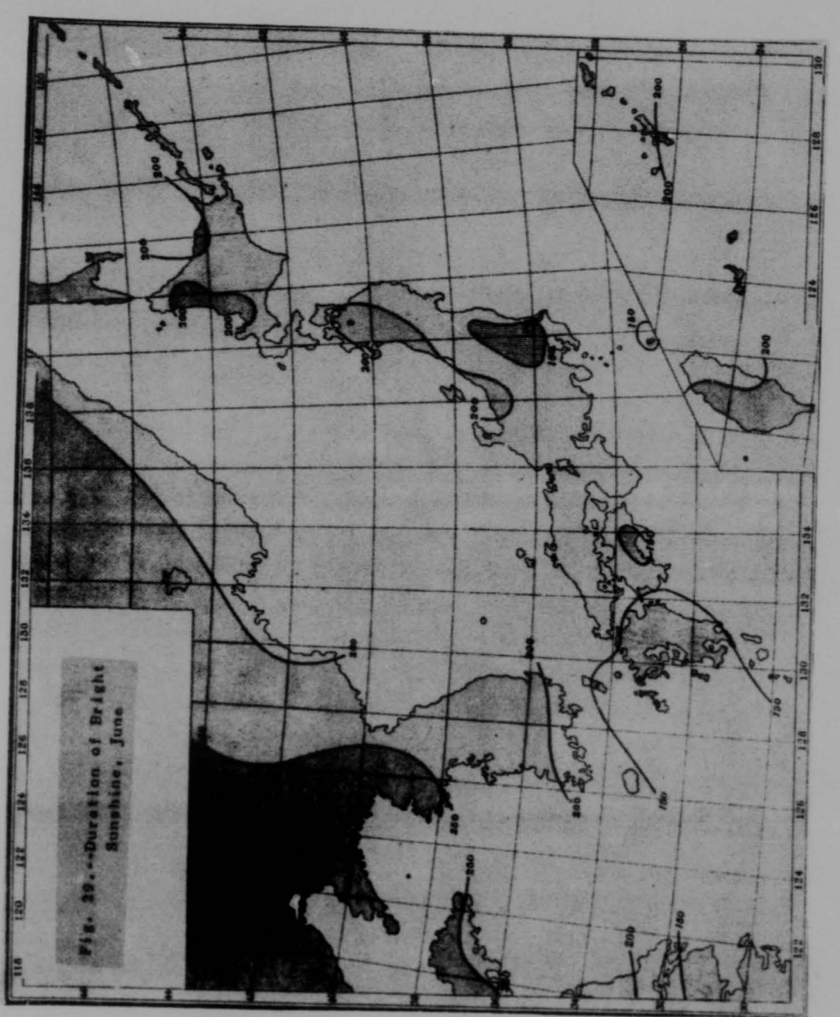


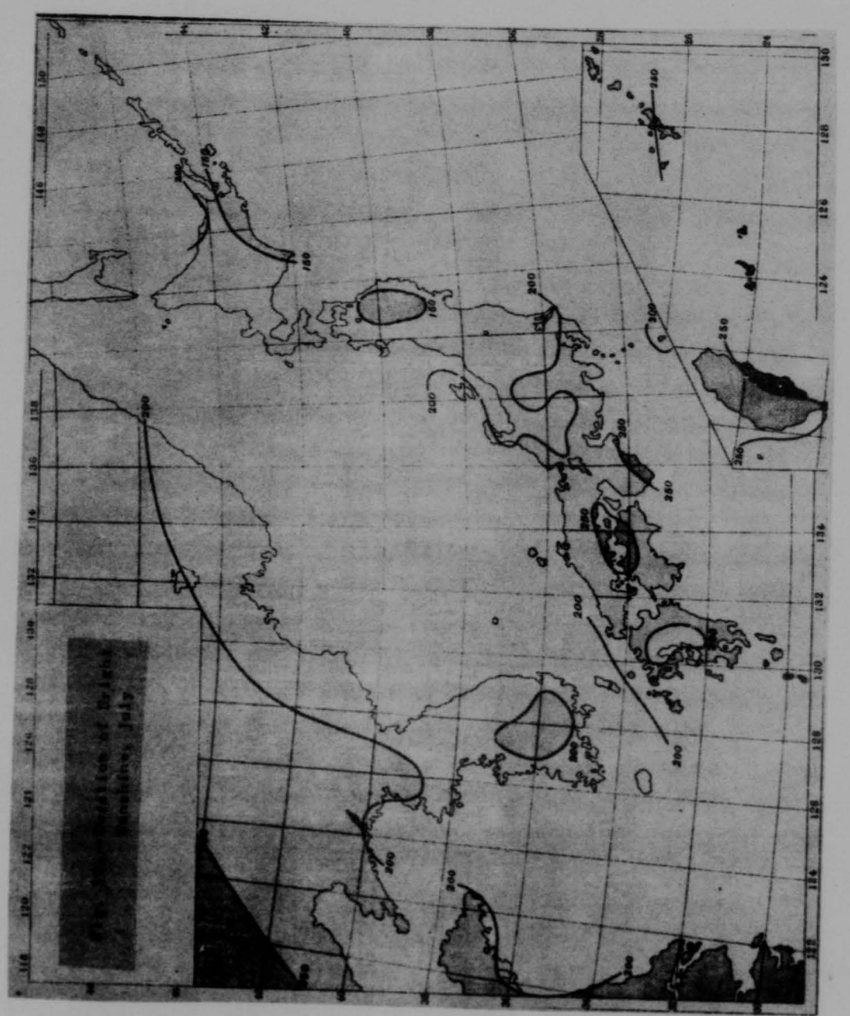
Fig. 29.--Duration of Bright Sunshine, June

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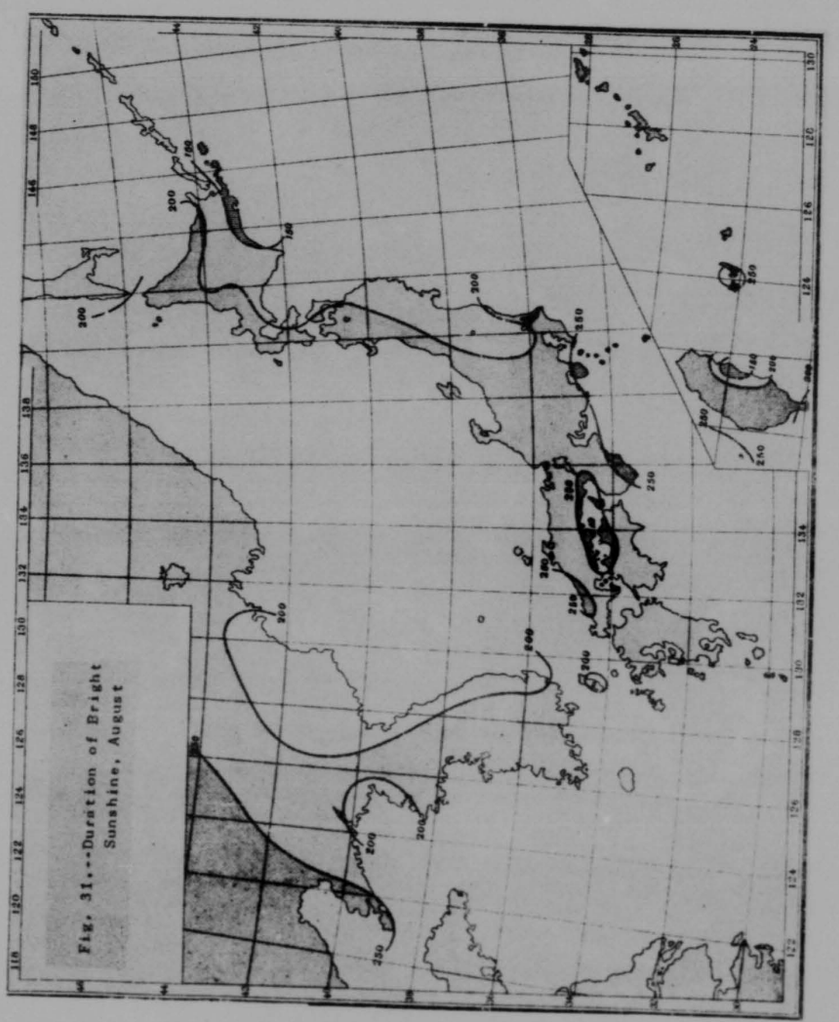


Fig. 31.--Duration of Bright Sunshine, August

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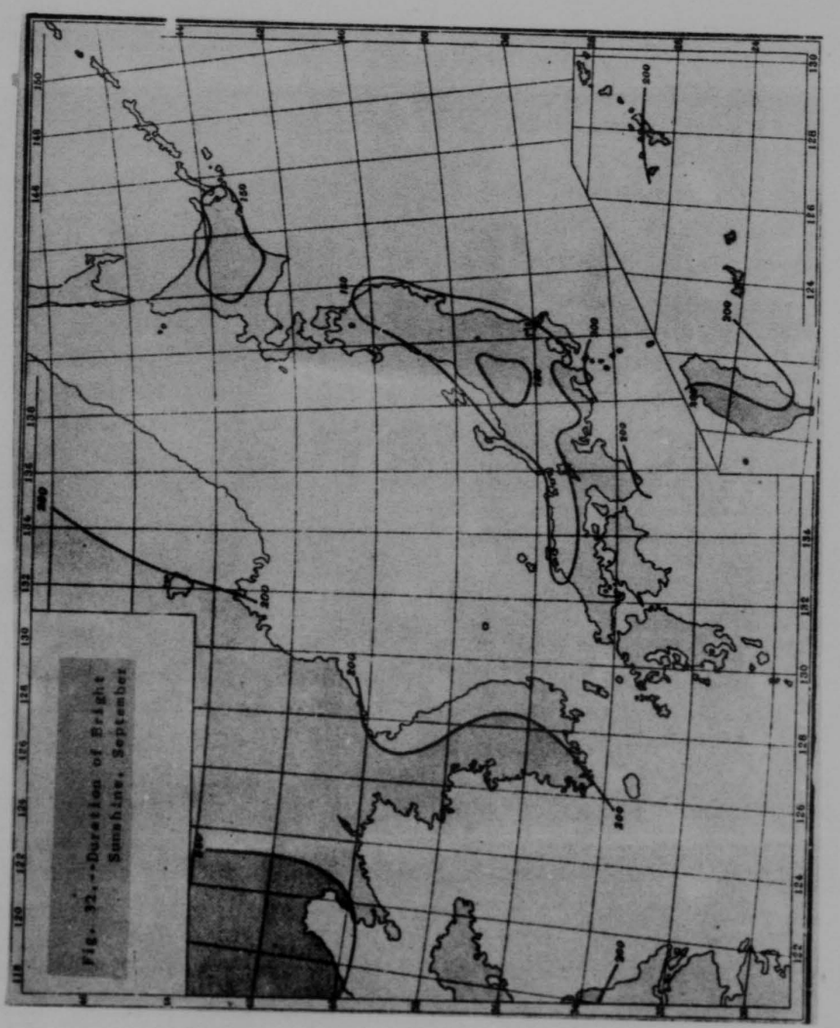


Fig. 32.--Duration of Bright Sunshine, September

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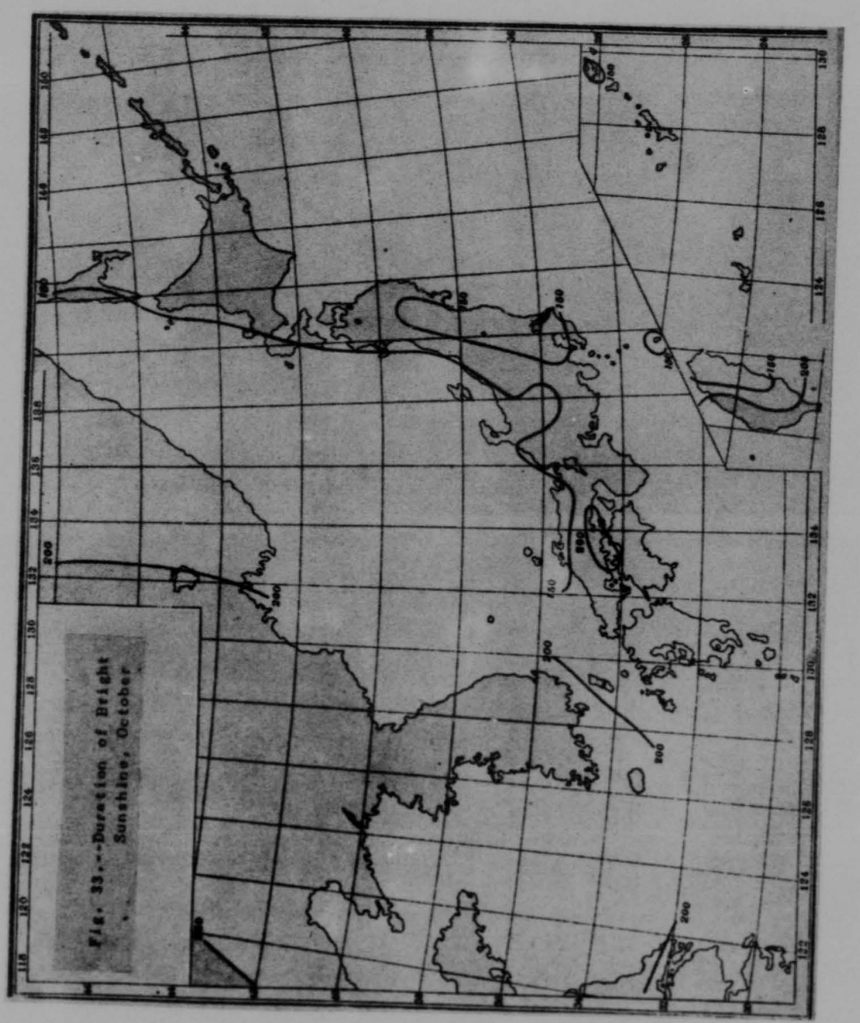


Fig. 33.--Duration of Bright Sunshine, October.

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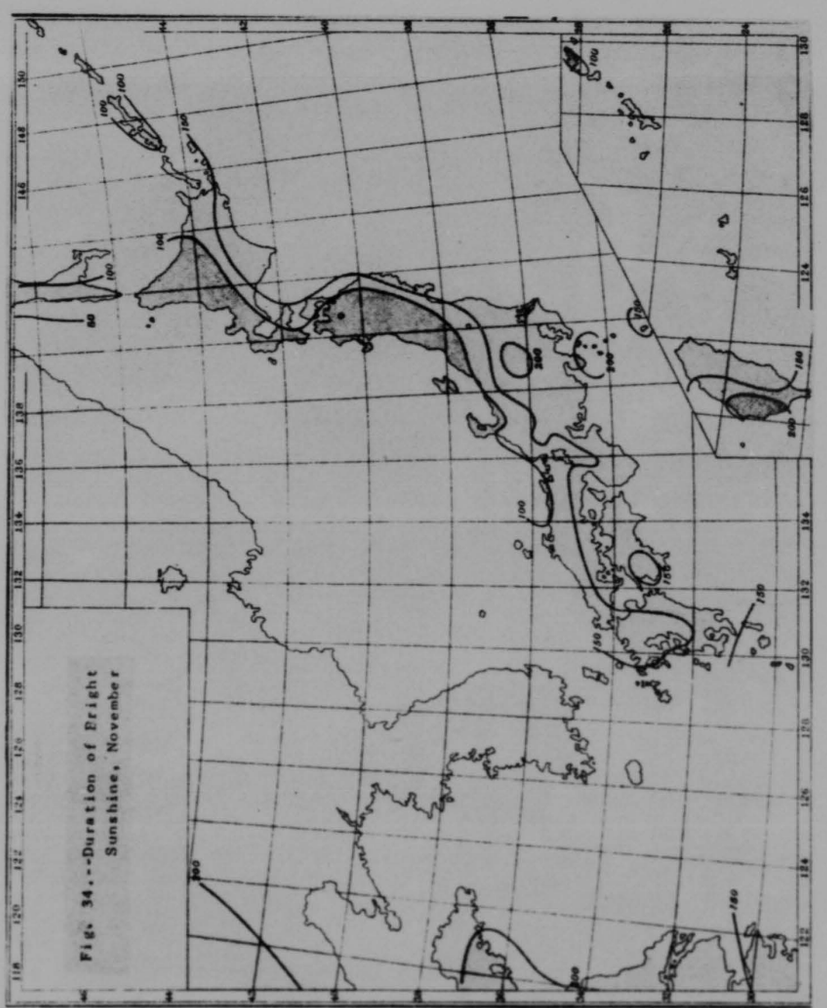


Fig. 34.--Duration of Bright Sunshine, November

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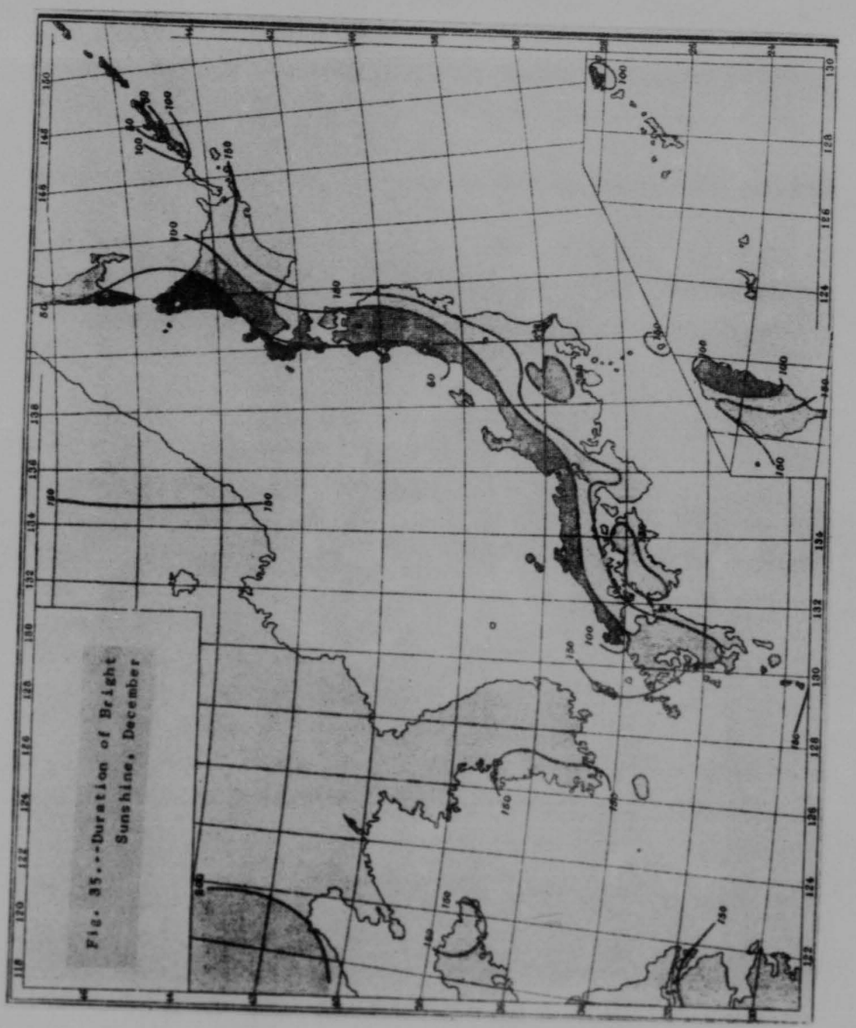


Fig. 35.--Duration of Bright Sunshine, December

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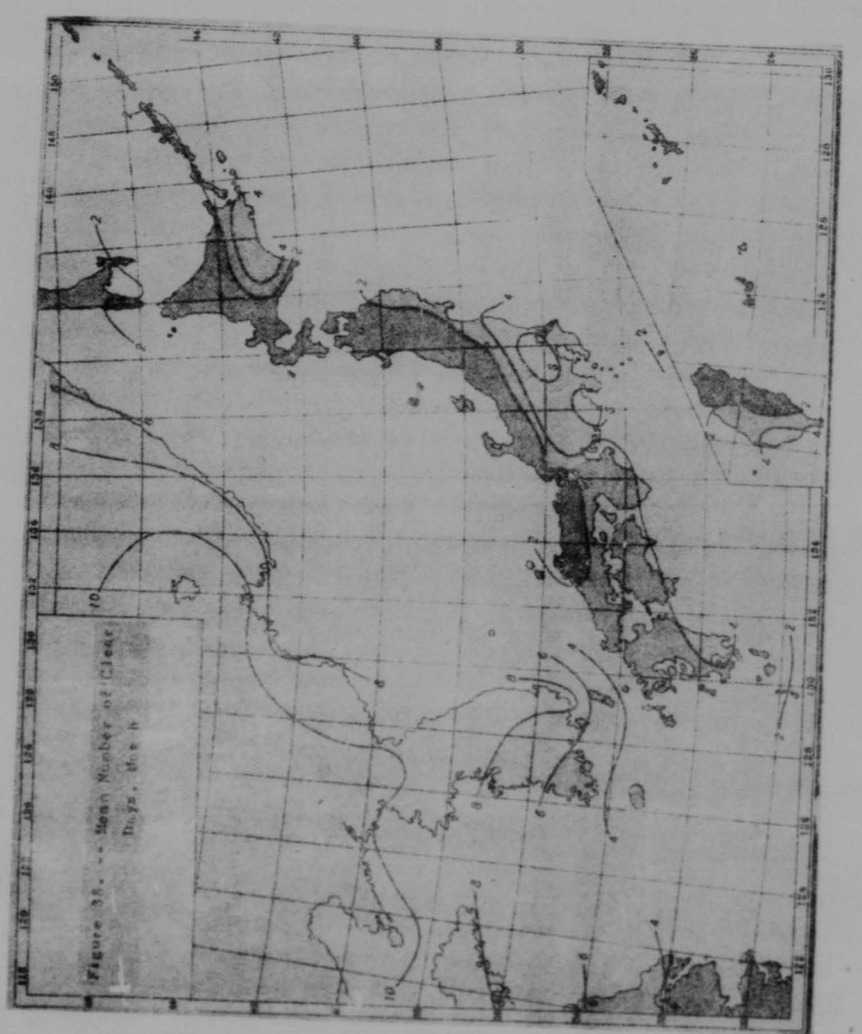


Figure 38. -- Mean Number of Clear Days, March

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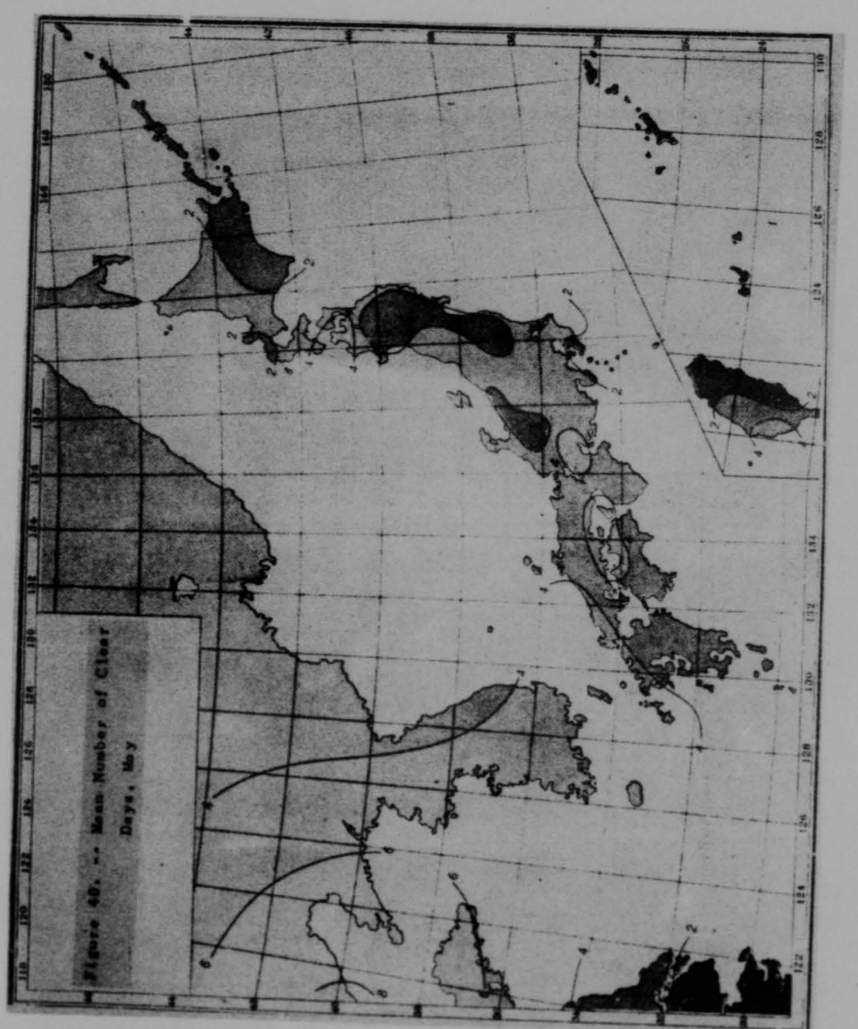


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Figure 41. -- Mean Number of Clear Days, June

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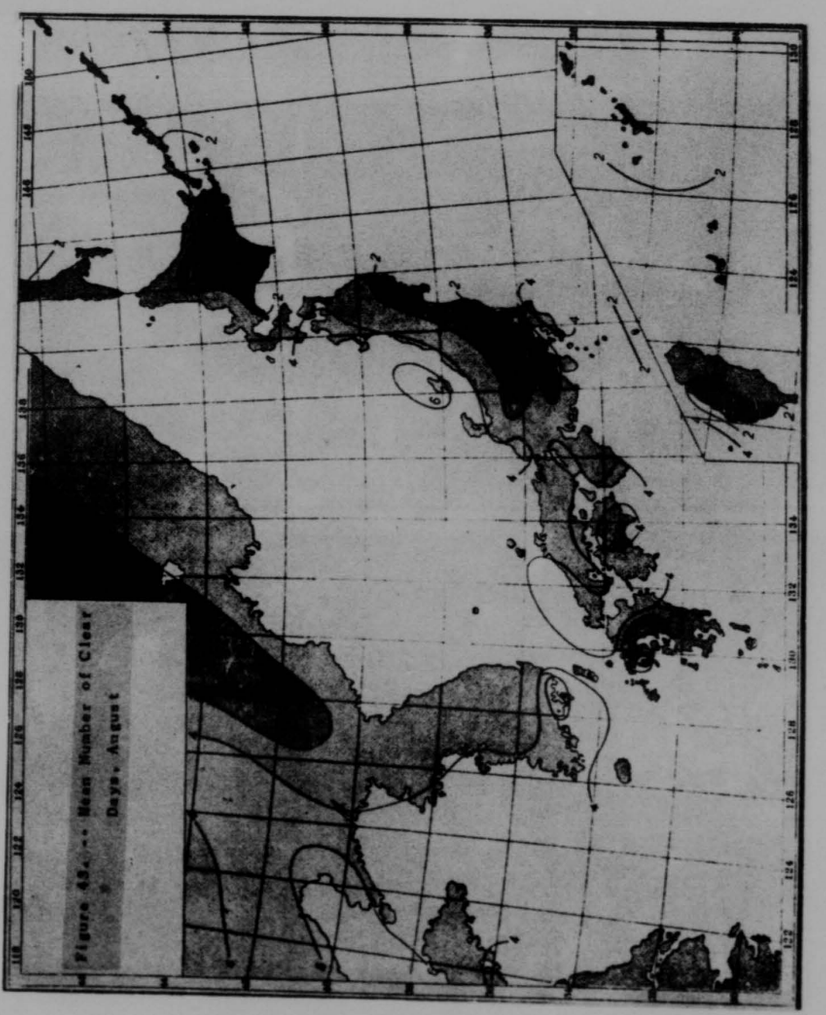


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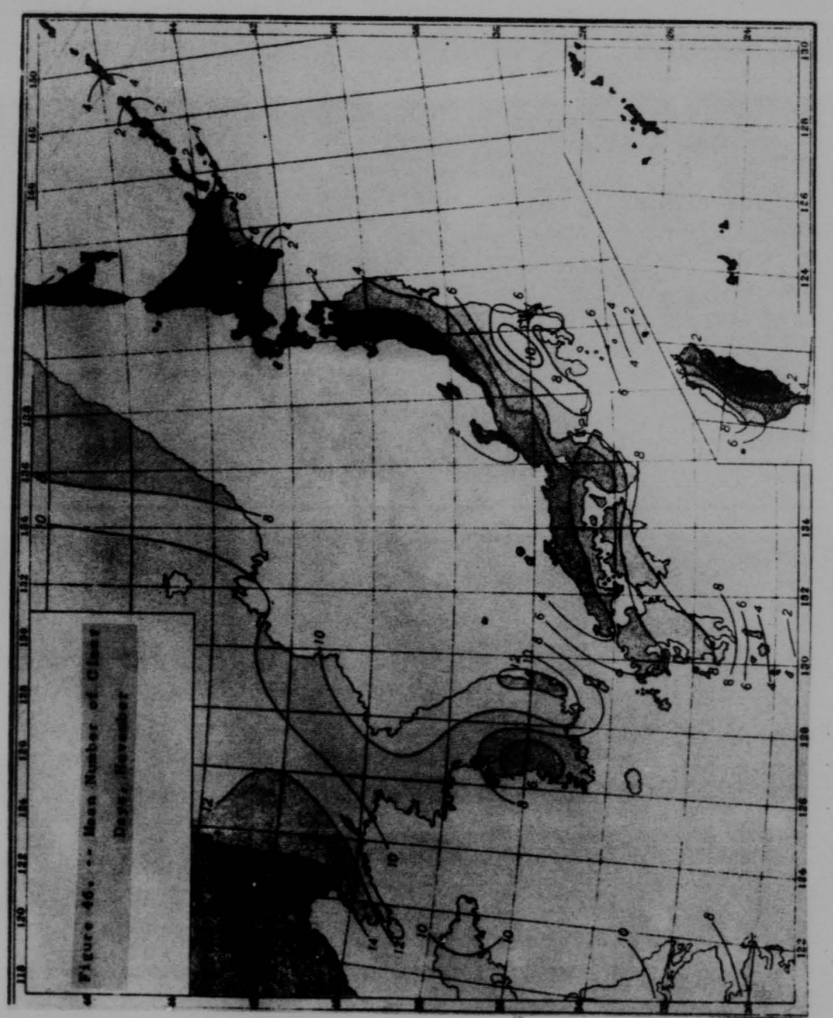


Figure 46. -- Mean Number of Clear Days, November

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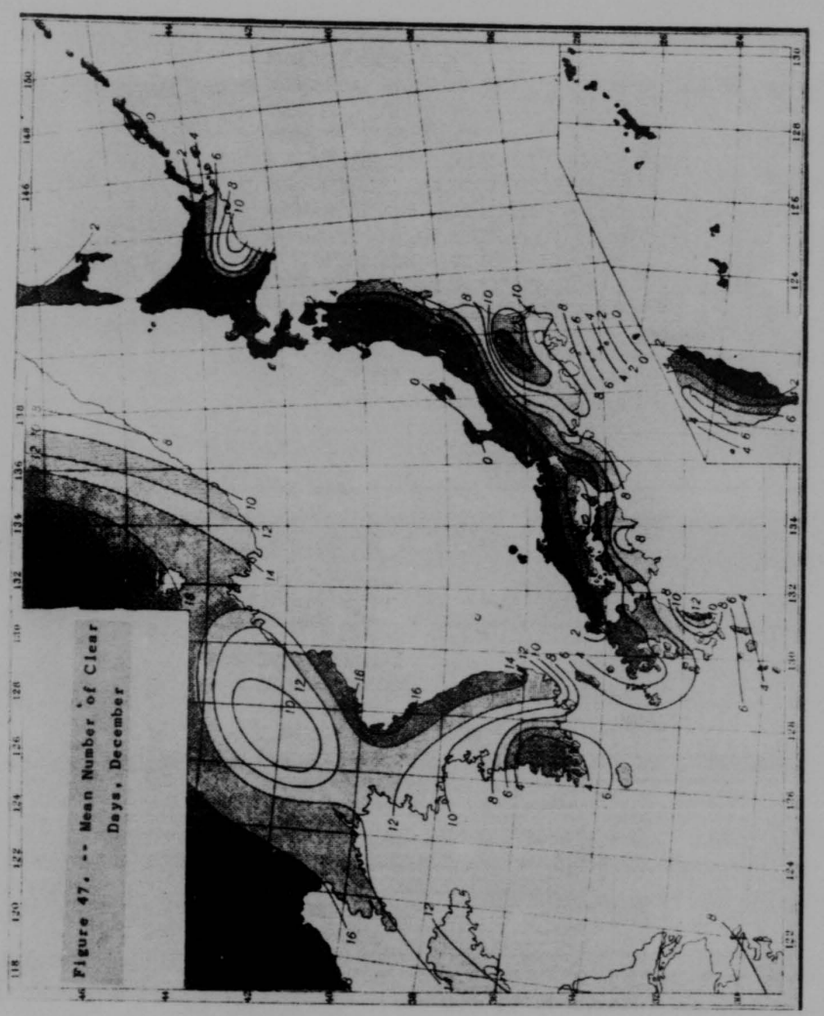


Figure 47. -- Mean Number of Clear Days, December

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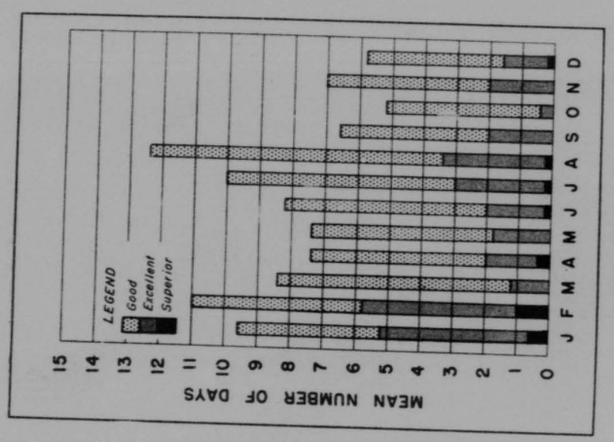


Fig. 48.--Mean Number of Days in Each Month with Conditions Favoring Burning at 0800, Tokyo

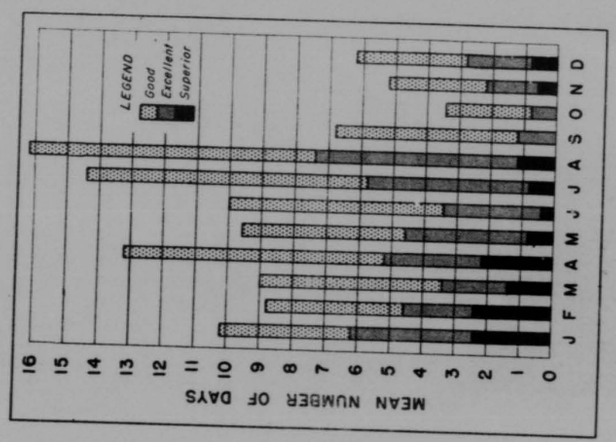


Fig. 49.--Mean Number of Days in Each Month with Conditions Favoring Burning at 0800, Osaka

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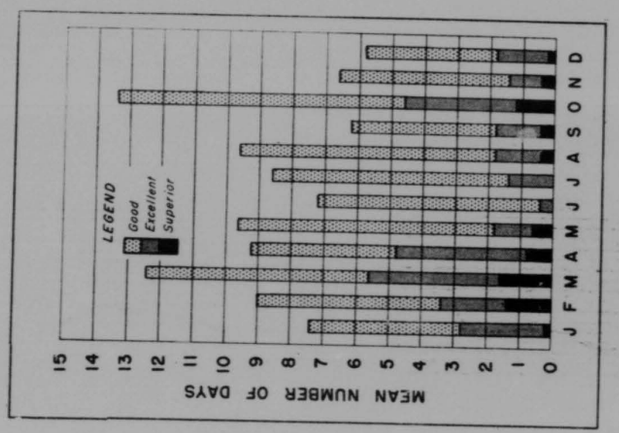


Fig. 50.--Mean Number of Days in Each Month with Conditions Favoring Burning at 0800, Nagasaki

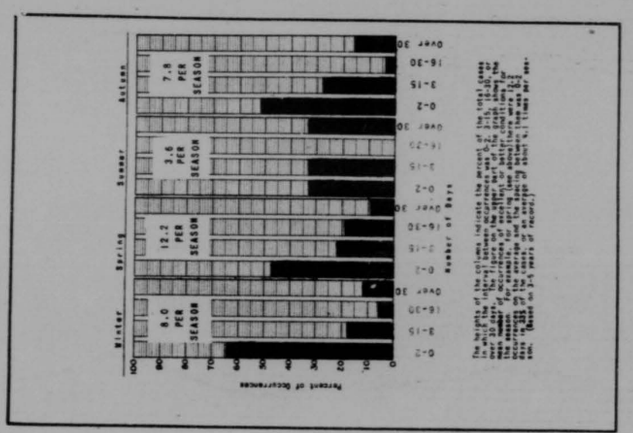


Fig. 51.--Intervals between Days on Which Burning Conditions Are "Excellent" or Better at 0800, Nagasaki

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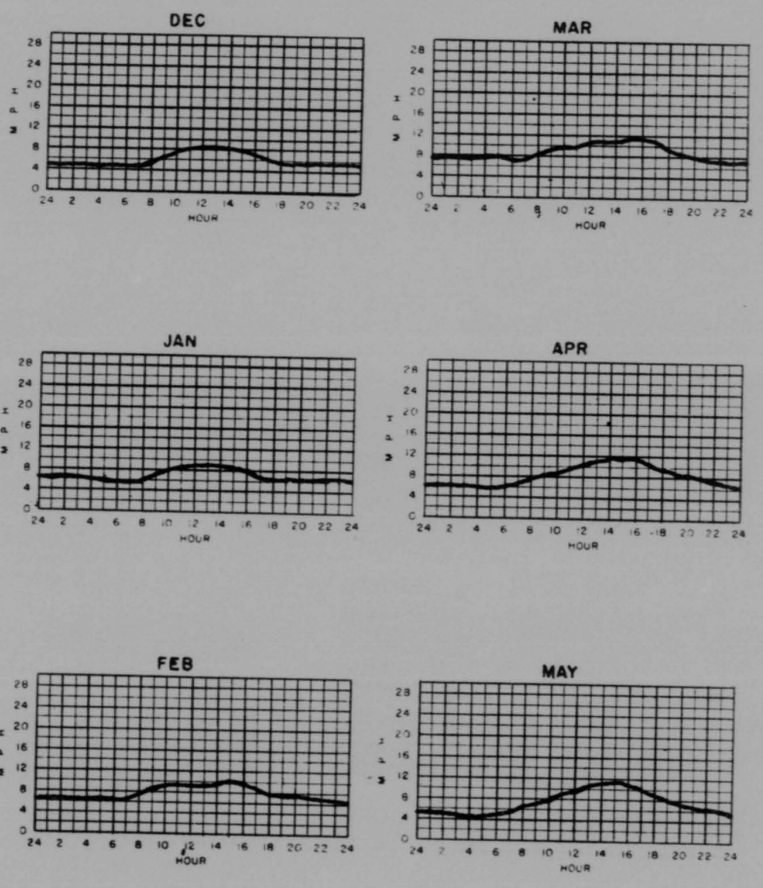
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Figure 52. -- Mean Diurnal Variations in Wind Velocity, Tokyo, December through May



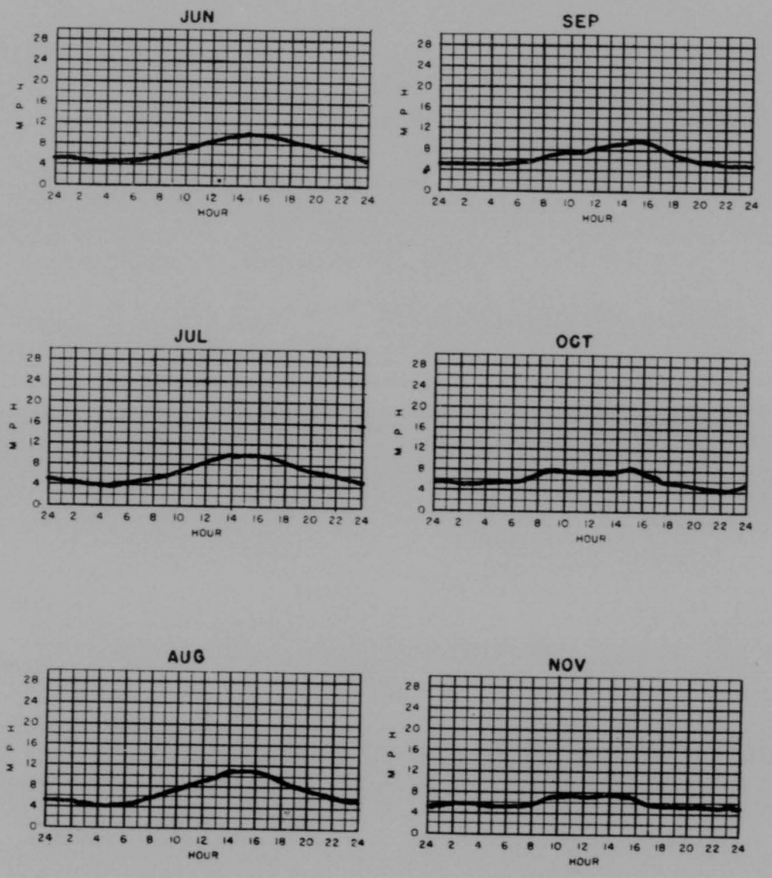
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Figure 53. -- Mean Diurnal Variations in Wind Velocity, Tokyo, June through November



C-675, AF

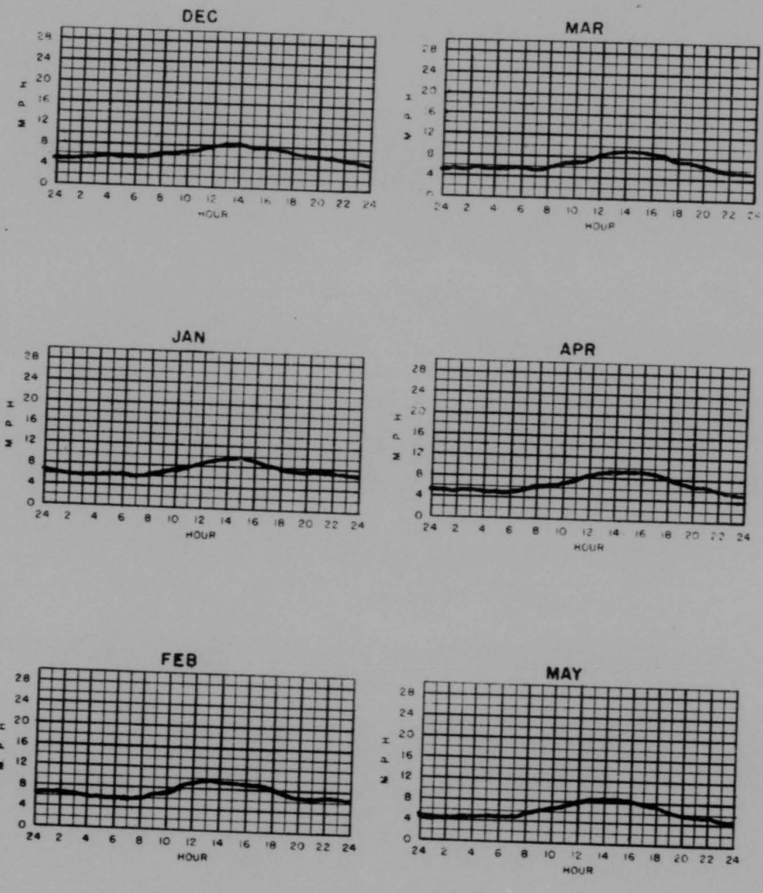
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Figure 54. -- Mean Diurnal Variations in Wind Velocity, Osaka, December through May



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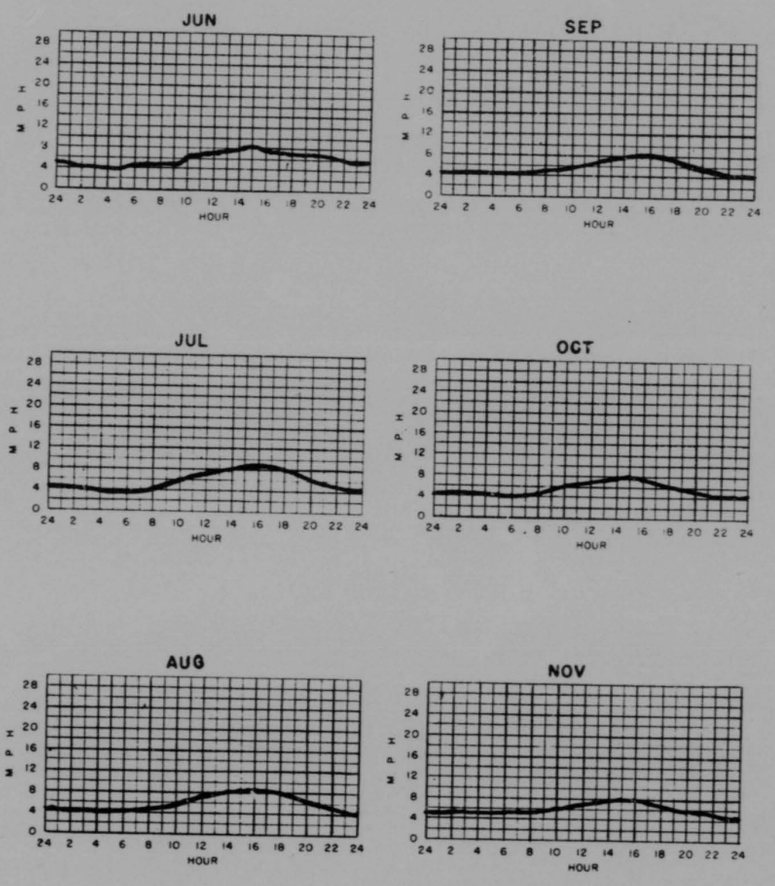
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Figure 55. -- Mean Diurnal Variations in Wind Velocity, Osaka, June through November



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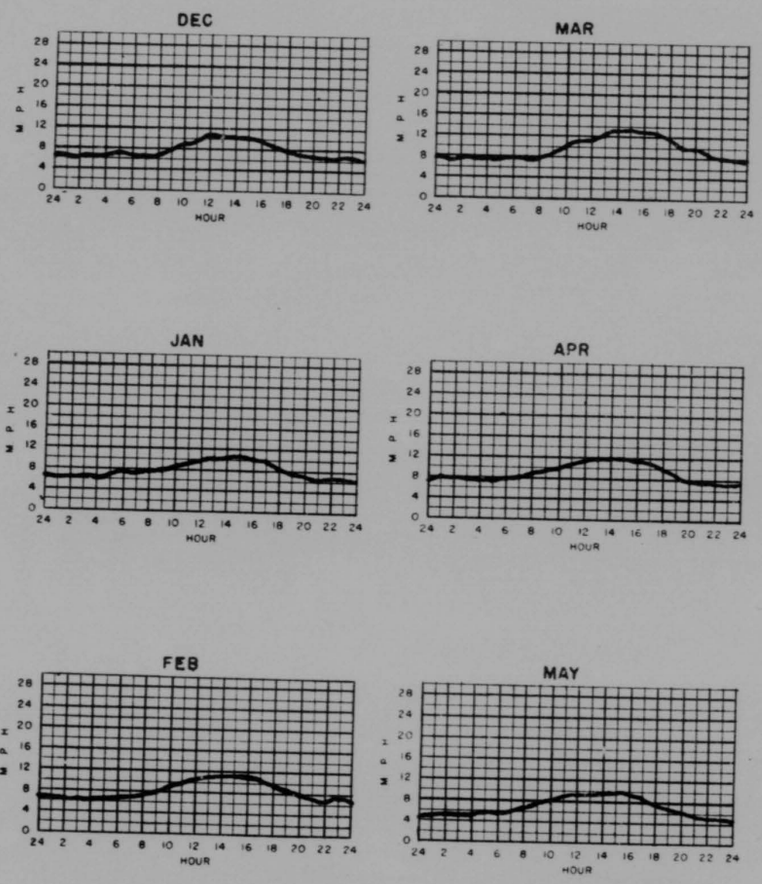
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Figure 56. -- Mean Diurnal Variations in Wind Velocity, Nagasaki, December through May



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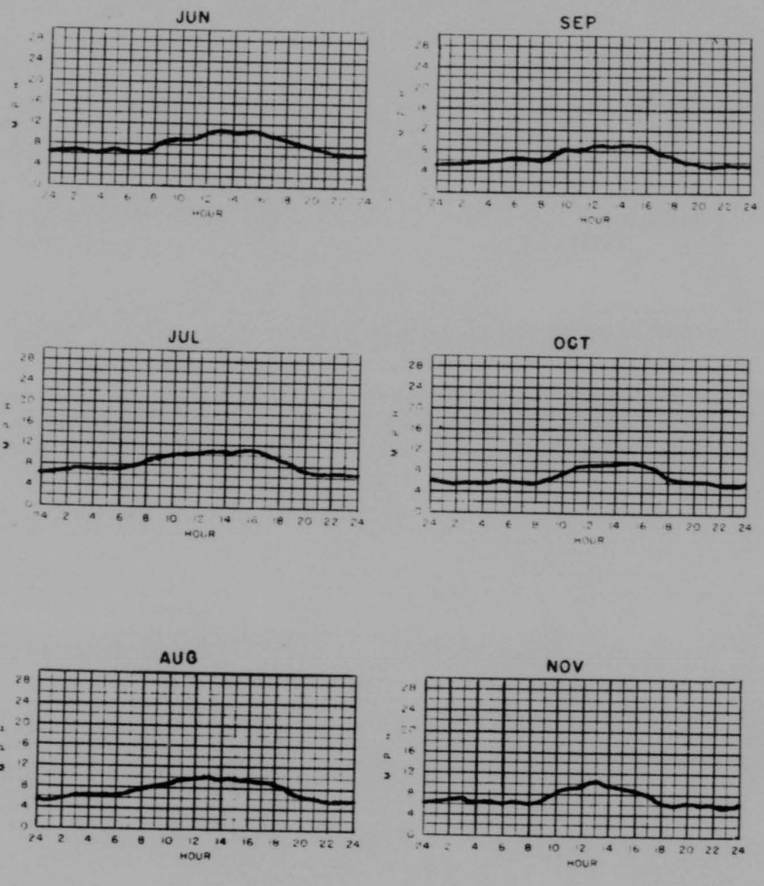
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Figure 57. -- Mean Diurnal Variations in Wind Velocity, Nagasaki, June through November



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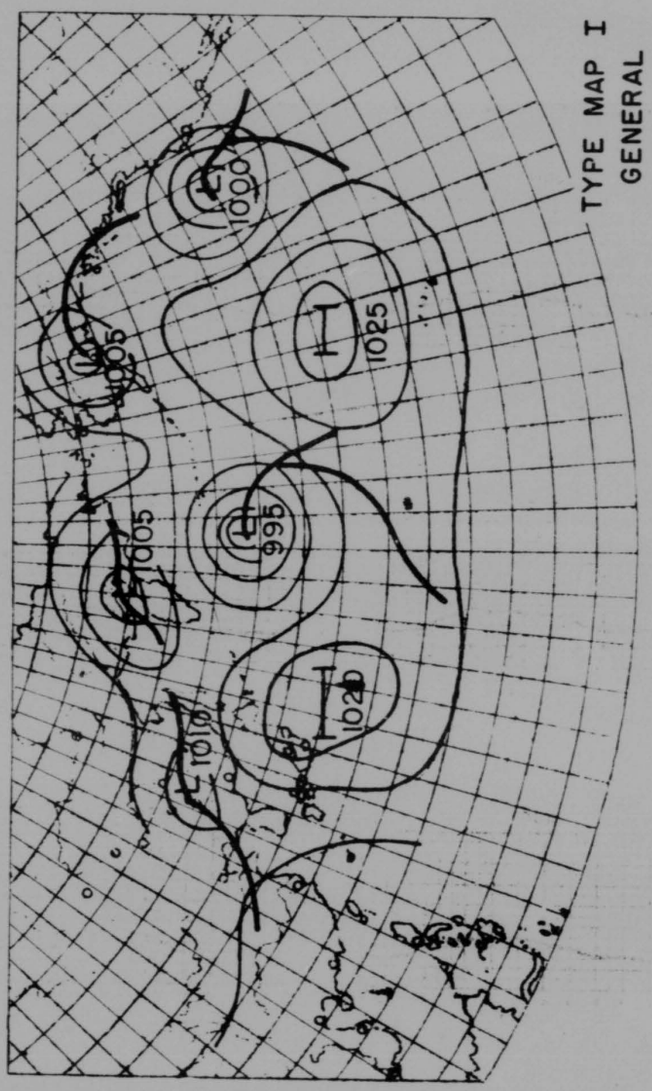


Fig. 58.--Conditions Favoring Incendiary Bombing of Japan, Type I

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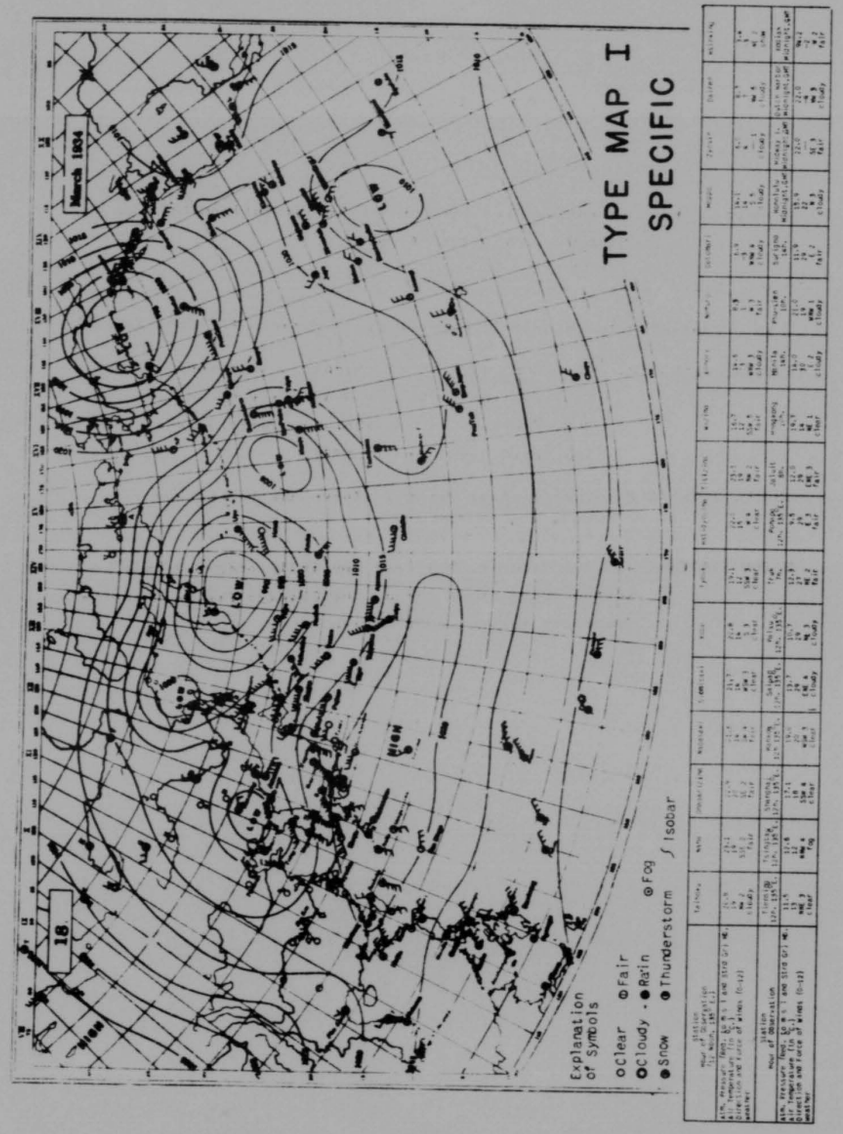


Fig. 59.--Conditions Favoring Incendiary Bombing of Japan, Type II

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SOURCE MATERIAL

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WEATHER CONDITIONS AFFECTING BOMBING OF JAPAN

REPORT NO. 463

REVISED

PUBLICATIONS OF WEATHER INFORMATION BRANCH
HEADQUARTERS ARMY AIR FORCES

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PUBLICATIONS OF WEATHER INFORMATION BRANCH
HEADQUARTERS ARMY AIR FORCES

WEATHER CONDITIONS AFFECTING BOMBING OF JAPAN

REPORT NO. 463

REVISED

Prepared by Special Studies Section, Weather
Information Branch, Headquarters
Army Air Forces

September 1943

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EXPLANATION OF METHODS AND CHARTS

The conclusions presented in this report have been obtained by methods of "synoptic climatology." That is, a five-year series of daily weather maps for the area has been examined critically by expert meteorologists who decided for each day whether the indicated operation would have been possible. This method has the advantages that it is relatively quick, requiring no research into past data; it can answer questions such as the possibility of high level formation flights (not possible by statistical methods); it is likely to be much more accurate since the weather map automatically correlates all the factors germane to the problem.

Figure 1 is a map of the area involved. Japan is divided into two target areas, northwest and southeast, by a backbone of mountains running roughly down the length of the islands. Since much of the weather over the islands is due to windward and leeward effects of mountains, this makes a natural division of targets for the area.

In figures 2, 3, and 6-16, inclusive, the number of days per month on which various operations are possible is shown. The upper line, marked "maximum," indicates the greatest number of days favorable for the operation in a particular month during the five-year record. The lower line, marked "minimum," indicates the least number of days favorable for the operation in a particular month during the five-year record. The line marked "5-year av." indicates the average conditions and, of course, need not fall halfway between the minimum and maximum conditions, since only one month in the five-year period is all that is necessary to displace the extremes disproportionately.

Figures 4 and 5 show the number of days per month closed to all types of bombardment. The "maximum" line indicates worst conditions, the "minimum" line best conditions, and the "5-year av." line average conditions.

In figures 17-22, inclusive, for a three-year period, the operational days from each base to the northwest and southeast target areas were tabulated according to the number per month which, from the standpoint of wind conditions, were poor, fair, and good for incendiary bombing. Other investigations have shown that wind force is the principal meteorological factor determining the degree of fire danger, and the following scale for rating spread of fire was used: poor, winds force 3 or less; fair, winds force 4 or 5; good, winds force 6 or more.

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INCENDIARY BOMBING OPERATIONS

On operational days from all three bases to the southeast target area, the most frequent winds of force 4 and 5 over the target area are northeast, west, and northwest. This indicates storm centers to the south, east, and northeast of Japan. On operational days from all three bases to the northwest target area, the most frequent winds of force 4 and 5 are from the southwest. This indicates storm centers to the northwest of Japan.

It should be noted that there is a well-marked diurnal tendency in the wind velocity, with the maximum at 1500 and a minimum from 2000 to 0600.

In general, incendiary conditions are best in the vicinity of cold fronts. Surface wind velocities are at a maximum in such areas, and, consequently, strong gustiness, which augments the spread of fires, is also at a maximum. Gusts are produced by frictional influence of objects on the surface and also by interrupting vertical air currents which accompany the unstable air near cold fronts.

Humidity differences are of lesser importance than gustiness. However, there is a considerable lee or drying out effect in the southeast target area with a westerly flow, and likewise in the northwest target area with a southerly flow. This drying out effect is experienced at the same time as the most frequent gusty winds and betters the incendiary conditions.

Cold fronts attended by copious precipitation would tend to nullify both the gustiness and drying out experienced above.

Linking the facts in the above paragraphs, the entire operation may be described from the standpoint of the actual weather map: on operational days to the southeast target area, the ideal attack is with northwest and west winds immediately following the cold frontal passage. On operational days to the northwest target area, the ideal attack is just prior to the cold frontal passage.

A comparison of actual winds for a one-year period at Tokyo, Niigata, and Kobe was made with the determined average winds for the northwest and southeast target areas. At Niigata and Kobe, the most frequent average winds as given for the respective target areas were southwest, force 4, and west, force 4. At both cities, the actual wind followed, in general, the average wind in force and direction.

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At Tokyo, the actual winds were significantly less in force than the average winds for the southeast target area, indicating that Tokyo is highly sheltered in all directions. Of the prevailing average winds for the year chosen, over half the actual winds were force 2 or less when the average wind was indicated as of force 4 or 5. Statistics are available to support the conclusion that Tokyo is sheltered. The following is a table of differences (mi./hr.) between the wind velocity at 1,600-2,000 feet and the average surface wind velocity at Tokyo and two other stations:

	Spring	Summer	Autumn	Winter
Hiroshima	6.2	5.1	7.3	5.9
Tokyo	9.5	4.2	10.3	14.5
Nagoya	7.0	3.5	7.3	10.3

The above table shows that, of the three cities, Tokyo is most sheltered except in summer, when it takes second place to Hiroshima.

In a Japanese scientific paper on Forest Fires and Weathers, by Torahiko Terada, the following conclusions are reached:

(1) The season with frequent forest fires in Japan extends through March, April, and May.

(2) For maximum fire risks, the maximum temperature should be above 68° F., the minimum above 59° F.

(3) The maximum of fire risk occurs about noon, two or three hours earlier than the maxima of temperature and wind velocity and the minimum of relative humidity; a result, supposedly, of the fact that this is a normal time for the lighting of fires for luncheon, smoking, etc.

(4) In the text of the article, it is implied that strong, gusty winds are necessary for favorable fire weather. These strong winds can be pictured in connection with marked frontal zones, or with the passage of cyclonic centers.

(5) Terada's charts indicate no variation in fire frequencies between the north and south portions of Honshu.

(6) Graphs for one year showed that the peak of forest fires and house fires coincided.

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A table from Professor Terada's article follows, showing the hourly distribution of forest fires.

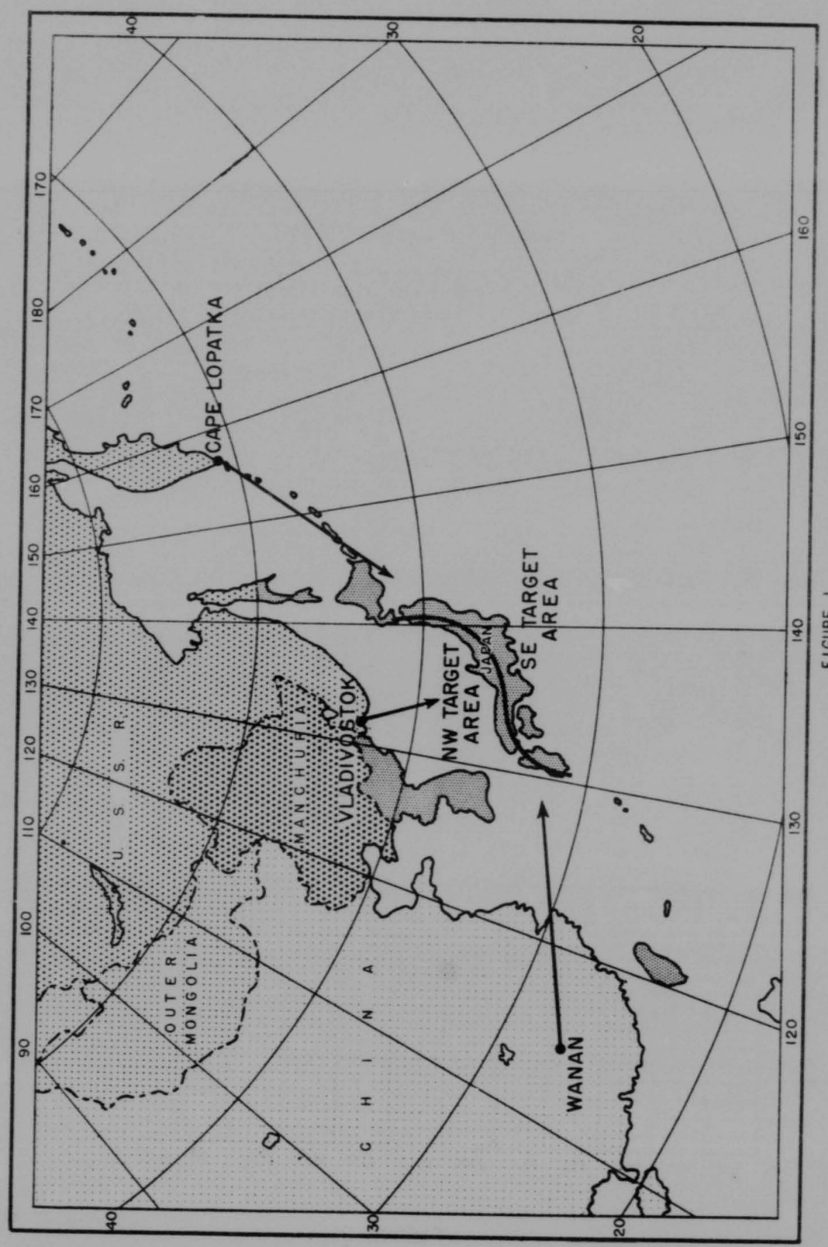
Hour	Sum (March 1928 - May 1931)	Per Cent
0100	7	0.13
0200	2	0.04
0300	4	0.07
0400	8	0.15
0500	3	0.06
0600	0	0.00
0700	5	0.09
0800	9	0.17
0900	28	5.20
1000	46	8.60
1100	69	12.90
1200	92	17.30
1300	80	14.90
1400	66	12.30
1500	36	6.70
1600	19	3.50
1700	12	2.20
1800	16	3.00
1900	11	2.10
2000	8	0.15
2100	7	0.13
2200	6	0.11
2300	0	0.00
2400	2	0.04

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FIGURE 1

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WEATHER AT VLADIVOSTOK BASE AND EN ROUTE TO JAPAN

NUMBER OF DAYS FLYABLE

Note: This expresses no coordination with conditions at the target--not significant for operational planning requiring good target conditions.

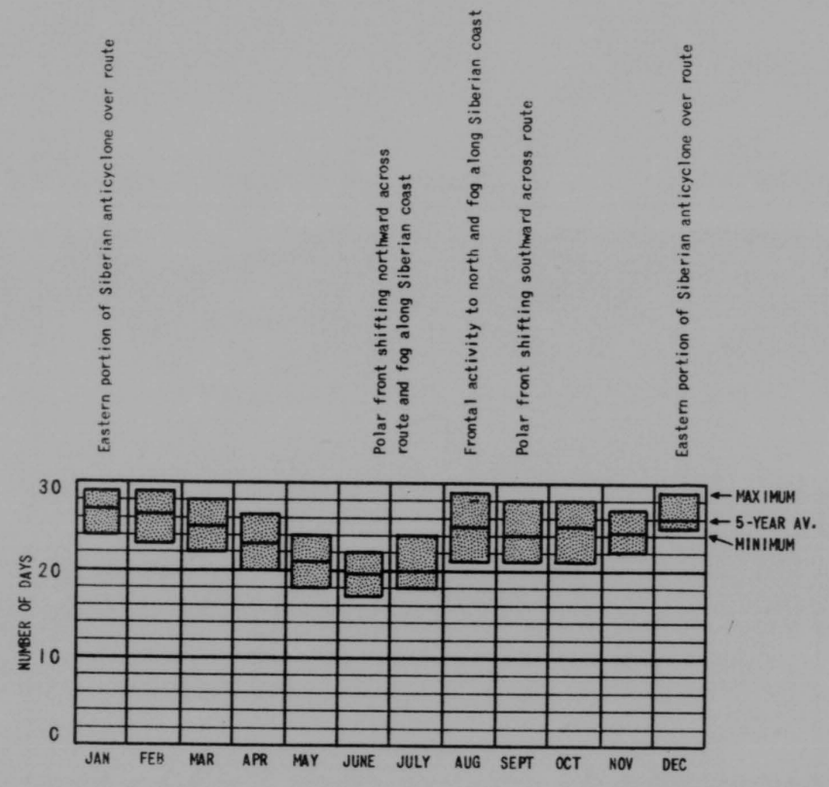


FIGURE 2

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WEATHER AT CAPE LOPATKA BASE AND EN ROUTE TO JAPAN

NUMBER OF DAYS FLYABLE

Note: This expresses no coordination with conditions at the target--not significant for operational planning requiring good target conditions.

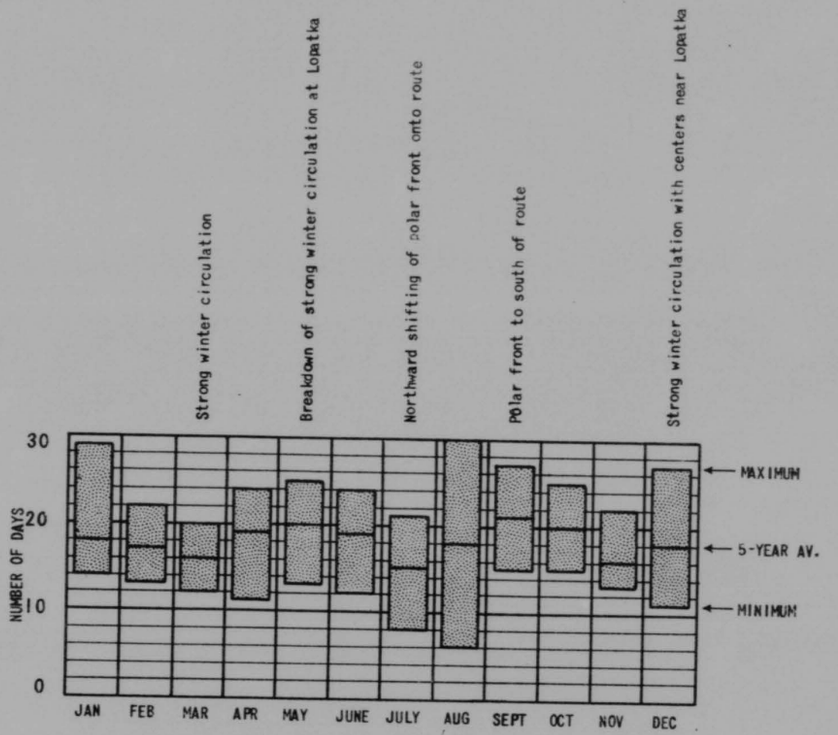


FIGURE 3 C4-2113,AF

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WEATHER OVER JAPANESE TARGET AREAS OF NORTHWESTERLY EXPOSURE
NUMBER OF DAYS CLOSED TO ALL TYPES OF BOMBARDMENT

Note: This expresses no coordination with conditions on route or at take-off point.

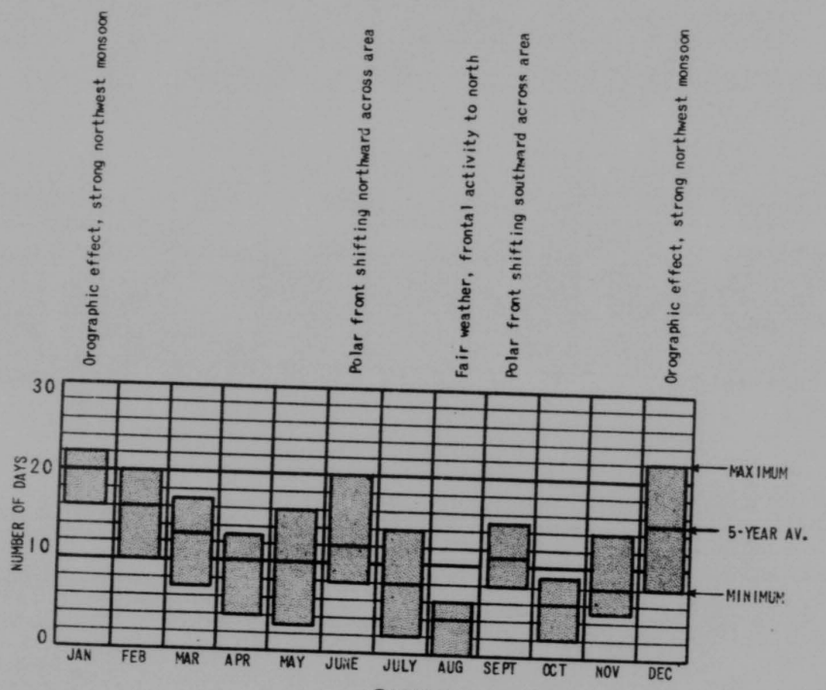


FIGURE 4

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WEATHER OVER JAPANESE TARGET AREAS OF SOUTHEASTERLY EXPOSURE
NUMBER OF DAYS CLOSED TO ALL TYPES OF BOMBARDMENT

Note: This expresses no coordination with conditions on route or at take-off point.

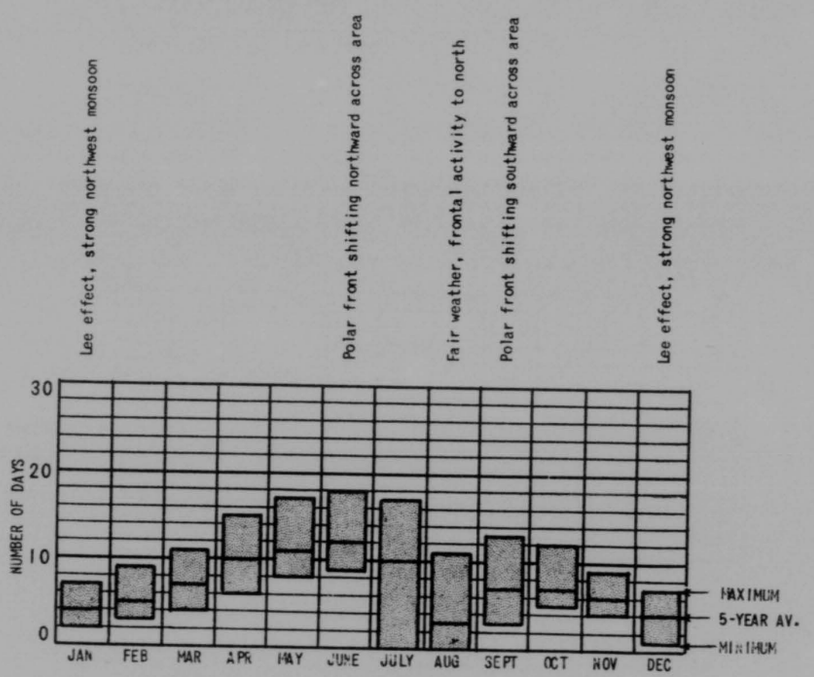


FIGURE 5

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TOTAL OPERATIONAL DAYS--VLADIVOSTOK TO JAPANESE TARGET AREA OF SOUTHEASTERLY EXPOSURE *

Note: All operational days are suitable for low level bombing. Operational days suitable for high level bombing are shown in figure below.

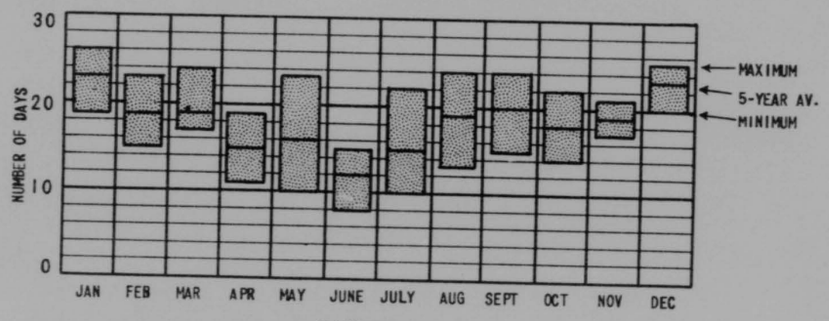


FIGURE 6

OPERATIONAL DAYS FOR HIGH LEVEL BOMBING--VLADIVOSTOK TO JAPANESE TARGET AREA OF SOUTHEASTERLY EXPOSURE*

Note: Same as Fig. 6 except clear or high scattered clouds at target.

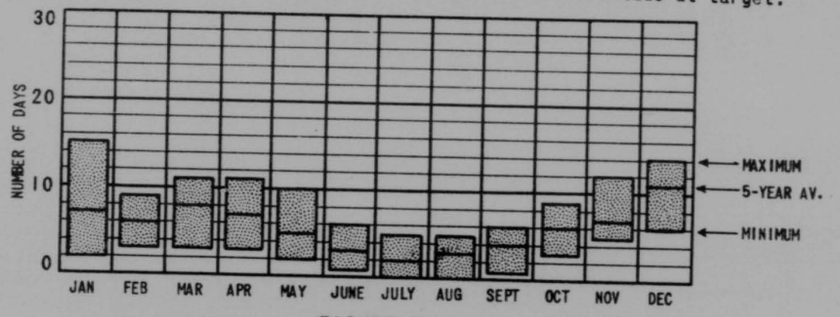


FIGURE 7

*This expresses coordination between conditions on route, at take-off point and at target.

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TOTAL OPERATIONAL DAYS--VLADIVOSTOK TO JAPANESE TARGET AREA OF NORTHWESTERLY EXPOSURE*

Note: All operational days are suitable for low level bombing. Operational days suitable for high level bombing are shown in figure below.

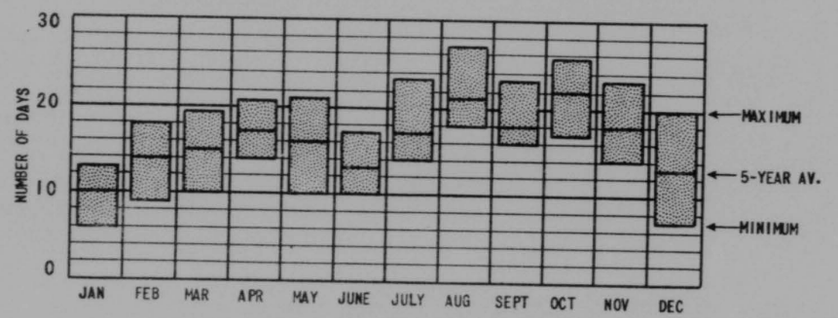


FIGURE 8

OPERATIONAL DAYS FOR HIGH LEVEL BOMBING--VLADIVOSTOK TO JAPANESE TARGET AREA OF NORTHWESTERLY EXPOSURE*

Note: Same as Figure 8 except clear or high scattered clouds at target.

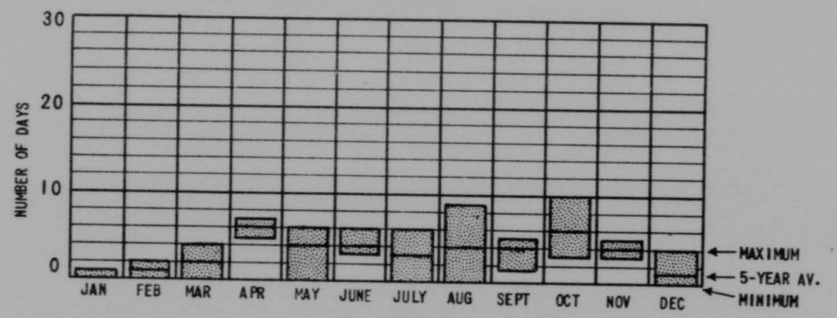


FIGURE 9

*This expresses coordination between conditions on route, at take-off point and at target.

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TOTAL OPERATIONAL DAYS--CAPE LOPATKA TO JAPANESE TARGET AREA OF NORTHWESTERLY EXPOSURE*

Note: All operational days are suitable for low level bombing. Operational days suitable for high level bombing are shown in figure below.

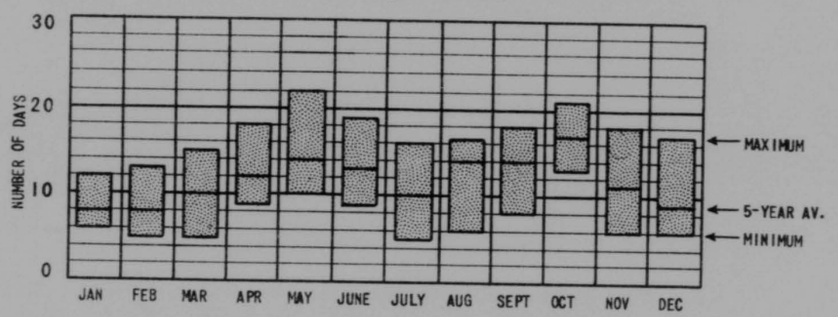


FIGURE 10

OPERATIONAL DAYS FOR HIGH LEVEL BOMBING--CAPE LOPATKA TO JAPANESE TARGET AREA OF NORTHWESTERLY EXPOSURE*

Note: Same as Figure 10 except clear or high scattered clouds at target.

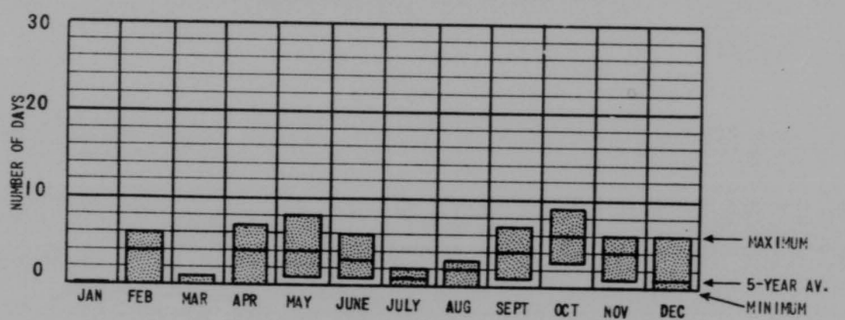


FIGURE 11

*This expresses coordination between conditions on route, at take-off point and at target.

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TOTAL OPERATIONAL DAYS--CAPE LOPATKA TO JAPANESE TARGET AREA OF SOUTHEASTERLY EXPOSURE*

Note: All operational days are suitable for low level bombing. Operational days suitable for high level bombing are shown in figure below.

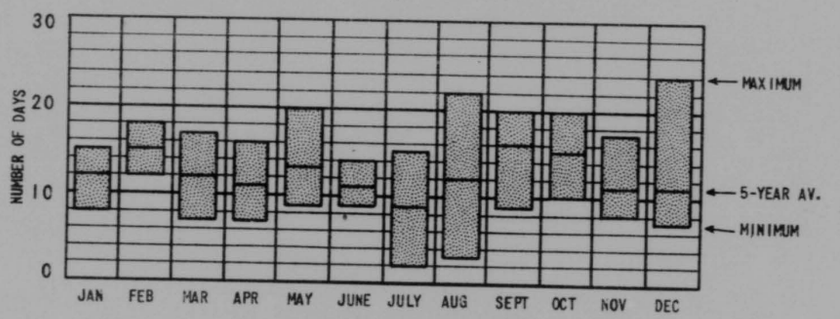


FIGURE 12

OPERATIONAL DAYS FOR HIGH LEVEL BOMBING--CAPE LOPATKA TO JAPANESE TARGET AREA OF SOUTHEASTERLY EXPOSURE*

Note: Same as Figure 12 except clear or high scattered clouds at target.

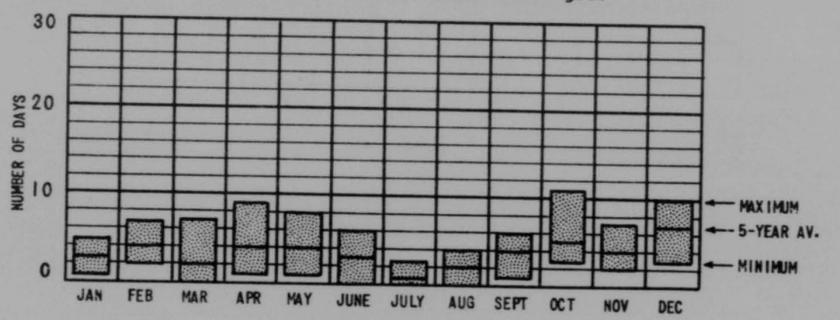


FIGURE 13

*This expresses coordination between conditions on route at take-off point and at target

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WEATHER AT WANAN AND EN ROUTE TO JAPAN
NUMBER OF DAYS FLYABLE

Note: This expresses no coordination with conditions at the target--not significant for operational planning requiring good target conditions.

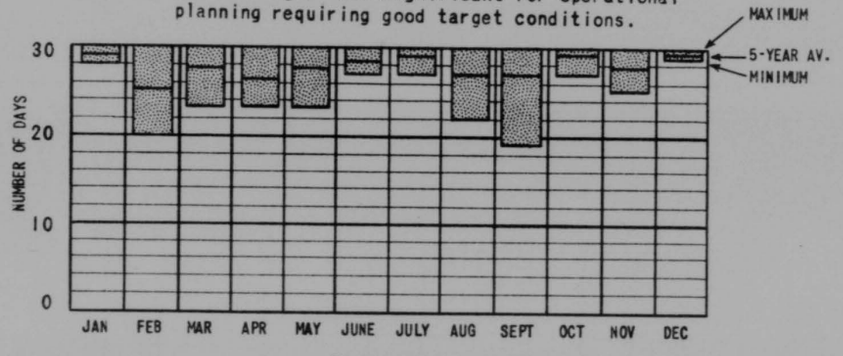


FIGURE 14

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TOTAL OPERATIONAL DAYS--WANAN TO JAPAN

Note: All operational days are suitable for low level bombing. Operational days suitable for high level bombing are shown in figure below.

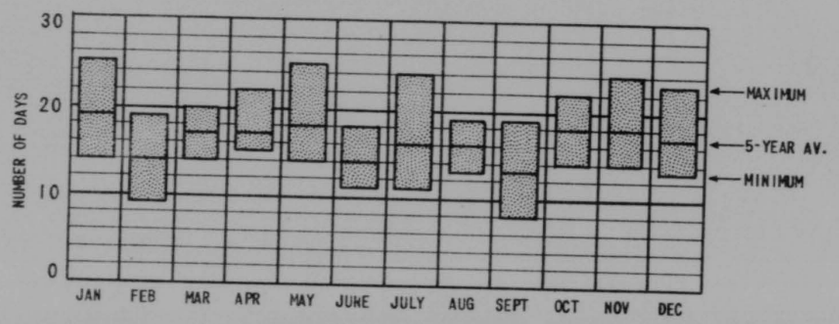


FIGURE 15

OPERATIONAL DAYS FOR HIGH LEVEL BOMBING--
WANAN TO JAPAN*

*Same as figure 15 except clear or high scattered clouds at target.

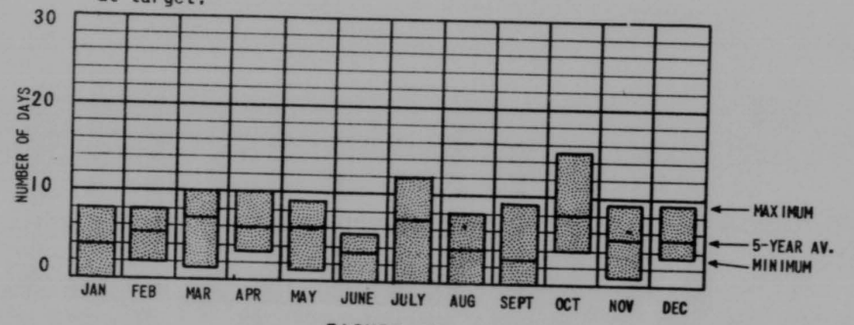


FIGURE 16

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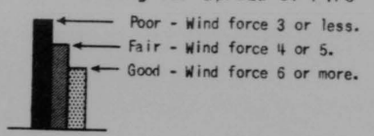
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TOTAL OPERATIONAL DAYS FOR INCENDIARY BOMBING
FROM CAPE LOPATKA

-3-YEAR AVERAGE-

LEGEND

Rating for Spread of Fire



JAPANESE TARGET AREA OF SOUTHEASTERLY EXPOSURE

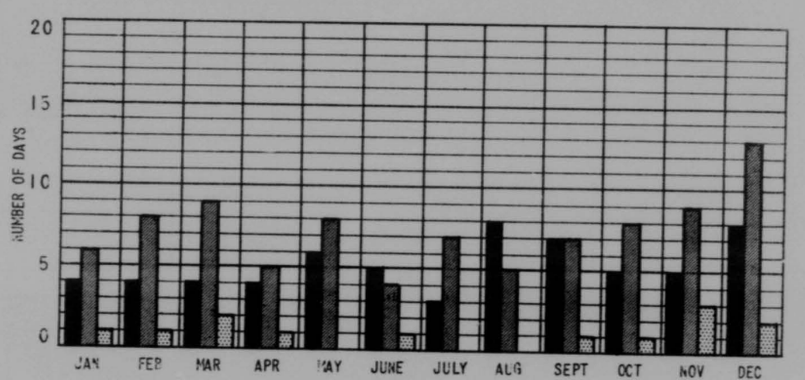


FIGURE 17

JAPANESE TARGET AREA OF NORTHWESTERLY EXPOSURE

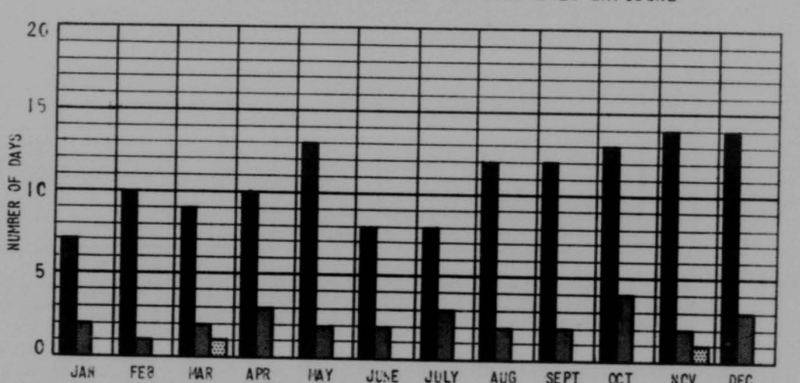


FIGURE 18

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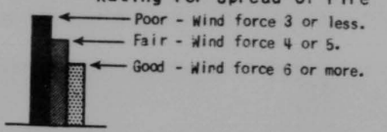
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TOTAL OPERATIONAL DAYS FOR INCENDIARY BOMBING FROM WANAN

-3-YEAR AVERAGE-

LEGEND

Rating for Spread of Fire



JAPANESE TARGET AREA OF SOUTHEASTERLY EXPOSURE

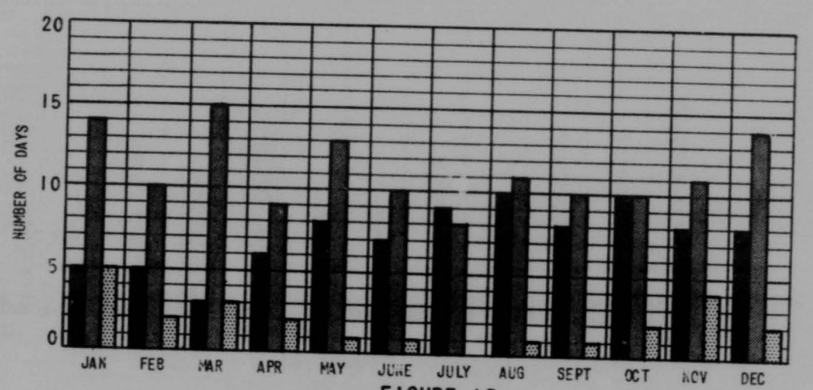


FIGURE 19

JAPANESE TARGET AREA OF NORTHWESTERLY EXPOSURE

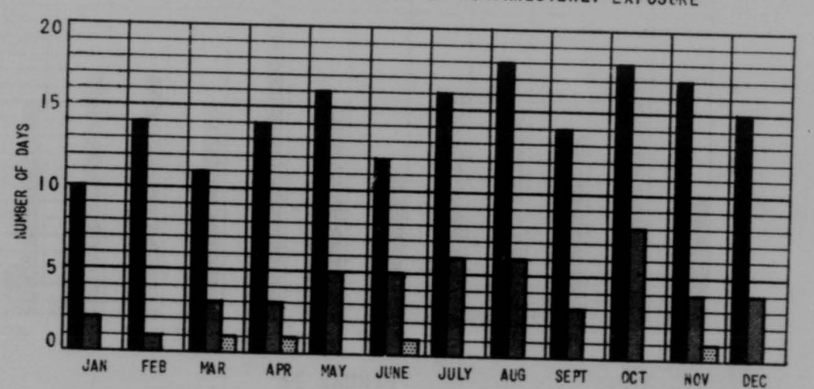


FIGURE 20

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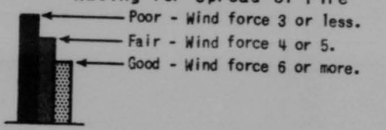
TOTAL OPERATIONAL DAYS FOR INCENDIARY BOMBING

FROM VLADIVOSTOK

-3-YEAR AVERAGE-

LEGEND

Rating for Spread of Fire



JAPANESE TARGET AREA OF SOUTHEASTERLY EXPOSURE

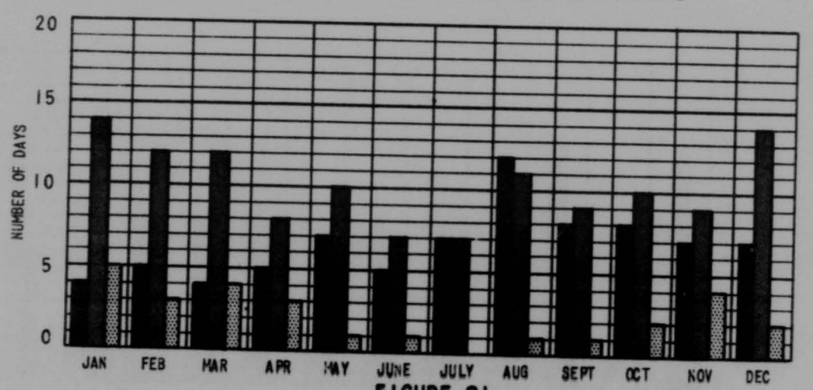


FIGURE 21

JAPANESE TARGET AREA OF NORTHWESTERLY EXPOSURE

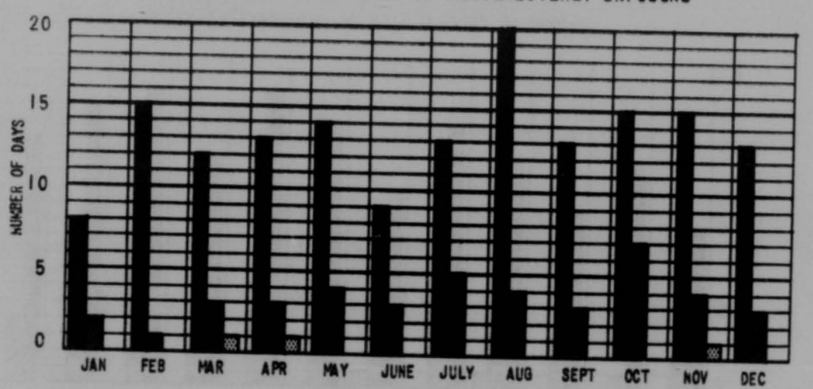


FIGURE 22

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a. First priority targets are aircraft/engine plants, neutralization of which will be quickly felt and will progressively weaken air opposition to the total attack on Japan. These strikes should be interspersed by full-scale incendiary attacks on 3 principal urban industrial areas. Results of these attacks, enemy reaction to them and to our other operations, and industrial intelligence from photo reconnaissance, will indicate whether this general type of attack should be pressed or, if Japan appears capable of a longer war, that strikes should be considerably shifted to coke/steel and other heavy industry targets.

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Aerospace Studies Inst
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Maxwell AFB, Alabama
NO. [illegible]

b. 10 plants within 1500 miles of the Marianas produce an estimated 50-75% of Jap combat aircraft/engines. The engine plants (Tab) should be attacked first, since their neutralization will have about as quick effect as destruction of plane assembly and they will stay out longer. On the basis that 50% of sorties dispatched will be effective it is estimated that 1700 5-ton sorties dispatched will

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neutralize these 10 targets. With scheduled effort, and operations beginning by Nov. 15, these 10 targets can be neutralized, if there are no alternate target strikes, by 1 March 1945, with a slight margin to spare.

c. The 3 priority urban industrial areas for incendiary attack are (1) Tokyo-Kawasaki-Yokohama-Yokosuka, (2) Nagoya, (3) Osaka-Amagasaki-Kobe. It now appears that 20 tons (in HE space equivalent) of M-69's or similar IB's per square mile over the target should saturate fire defenses and start conflagrations in these cities. On this basis 1,632 tons will be required for the Tokyo Bay area, 416 tons for Nagoya, and 1,034 tons for Osaka-Amagasaki-Kobe. This means 620 5-ton sorties over the target, or, if 50% of sorties dispatched are conservatively figured as effective, 1240 dispatched sorties. These sorties will be tentative until there is operational experience, and will be increased by inclusion of frags. These IB attacks plus the 10 aircraft strikes can be

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accomplished by 15 April 1945. Since saturations of an entire area is desired, Nagoya should be attacked first, leaving the other two areas until sufficient effort can be applied. Assuming that meantime the Yawata-Tobata-Kokura area has been attacked from Chengtu, the four principal urban industrial areas in Japan will have had saturation incendiary attacks, with anticipated wide effect on the Jap economy.

d. By April 15 re-attack on aircraft/engine plants may be required. By that time there will be considerable basis for evaluating the Jap air position, the effectiveness of the incendiary bombing, any major additions to aircraft and other capacity as shown by reconnaissance, and in general the Jap capability for a relatively short or relatively long war. By 15 April there may be carrier-borne attacks on Japan Proper, or significant other developments in the total attack, and indication of particularly critical Jap weak points. Decision can then be made as to whether to press IB attacks on additional

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f. Secondary targets, in areas containing a large number, are:

AAF Target No.	Target Name	General Location
496	Tokyo-Shibaura No. 1 (radar)	Kawasaki
497	Nippon Electric (Tama) (radar)	Kawasaki
133	Shibaura Engineering (elec eq, machine tools)	Kawasaki
1139	Toyoda Auto Wks (Koromo) (aircraft components)	Nagoya
1815	Toyo Bearing (Kuwana)	Nagoya
1716	Toyo Bearing (Kuwana)	Nagoya
197	Nagoya Arsenal (Atsuta)	Nagoya
263A	Sumitomo (propellers, dural)	Osaka
382	Osaka Arsenal	Osaka
171	Kawasaki Dockyard (marine engines)	Kobe

Urban Areas

Kure

Hiroshima

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5 July 1944. pgb [redacted]

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cities and strikes against supporting aircraft targets (propellers, ball bearings, etc.) and targets whose destruction will have fairly quick effects, or whether to begin attack on coke/steel and other targets in an attrition of a Jap economy judged capable of continuing the war for a considerably longer time. Possibility of the latter decision at that time has no major bearing on the present decision. Most of the effort will be in attacks on top priority aircraft targets. The incendiary bombing would delay attacks on coke/steel or similar target systems by a maximum of 6 weeks, which is not significant in the relatively long time-lag before front-line effect of such attacks.

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e. Priority targets in accordance with the above are:

Aircraft Engines

AAF Target No.	Target Name	General Location
357	Nakajima (Musashino)	Tokyo
356	Nakajima (Ogikubo)	Tokyo
194	Mitsubishi (Kokuki)	Nagoya
193	Mitsubishi (Hatsudoki)	Nagoya
1547	Kawasaki (Akashi)	Kobe

Aircraft

1545	Nakajima (Koizumi)	50 mi NW of Tokyo
1544	Nakajima (Ota)	50 mi NW of Tokyo
198	Aichi (Chitose)	Nagoya
240	Kawasaki (Kag'a)	Nagoya
16	Kawanishi (Naruo)	Amagasaki

(excluding Omura Aircraft, within range from China)

Urban Areas

Nagoya

Tokyo-Kawasaki-Yokohama-Yokusuka

Osaka-Amagasaki-Kobe

(excluding Yawata-Kokura, Sasebo, Nagasaki, within range from China)

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TARGETS--JAPAN

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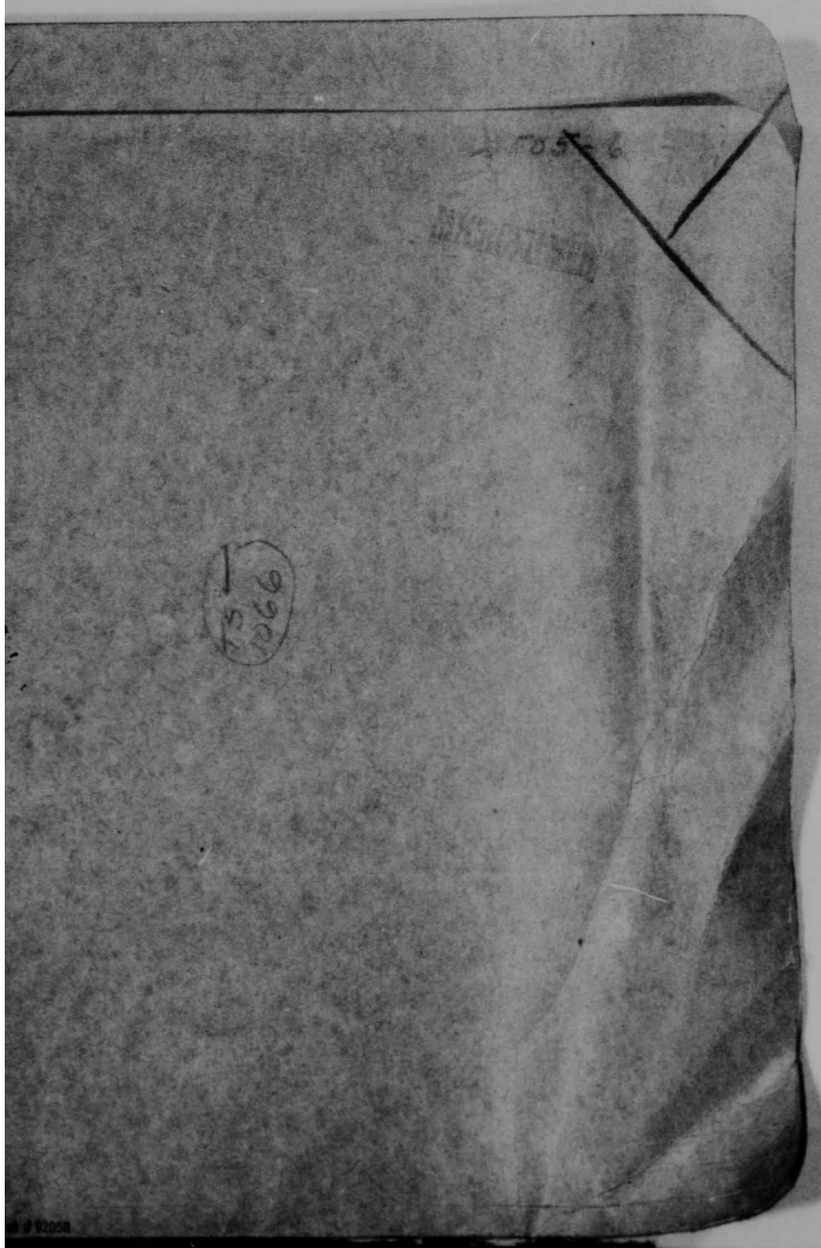
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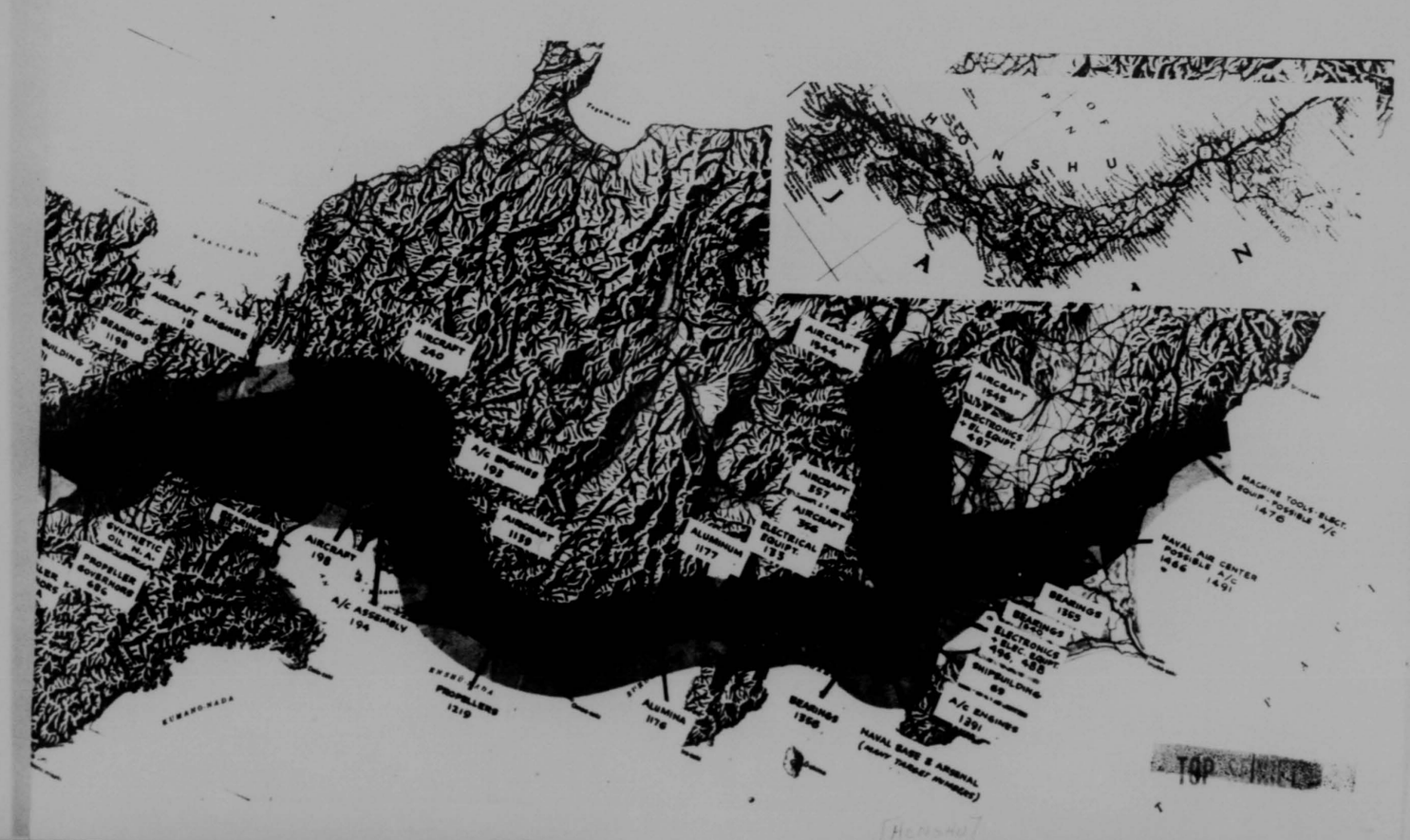
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Radar Operator's Target Folder - JAPAN
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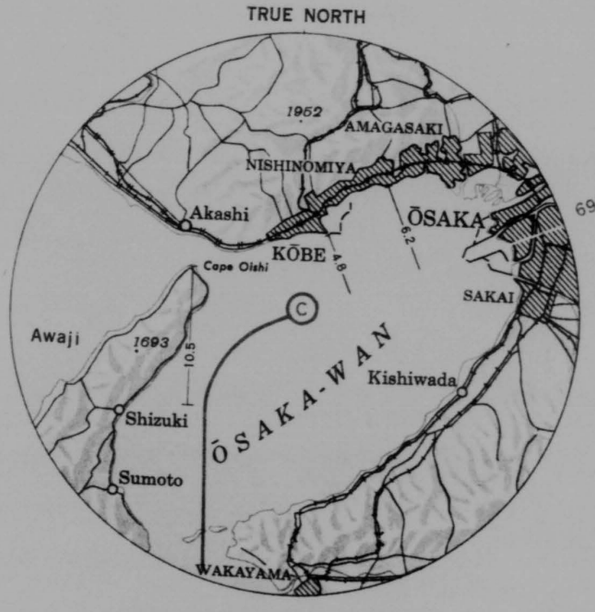
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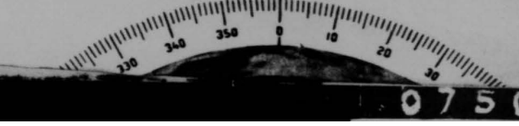
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POINT C

15 Nautical Miles from Target



20 MILE SWEEP





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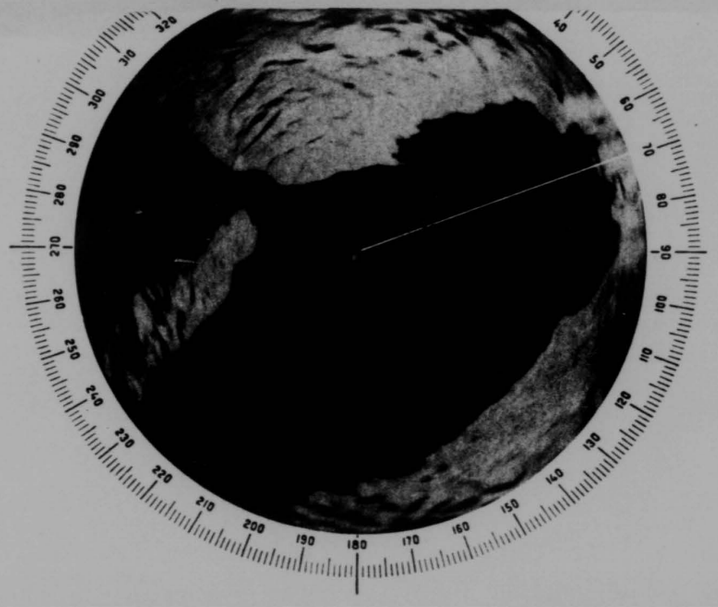
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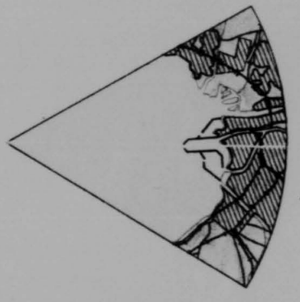
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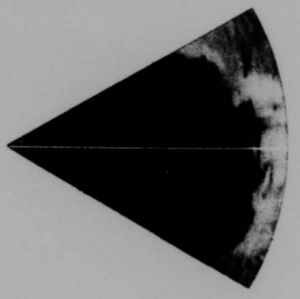
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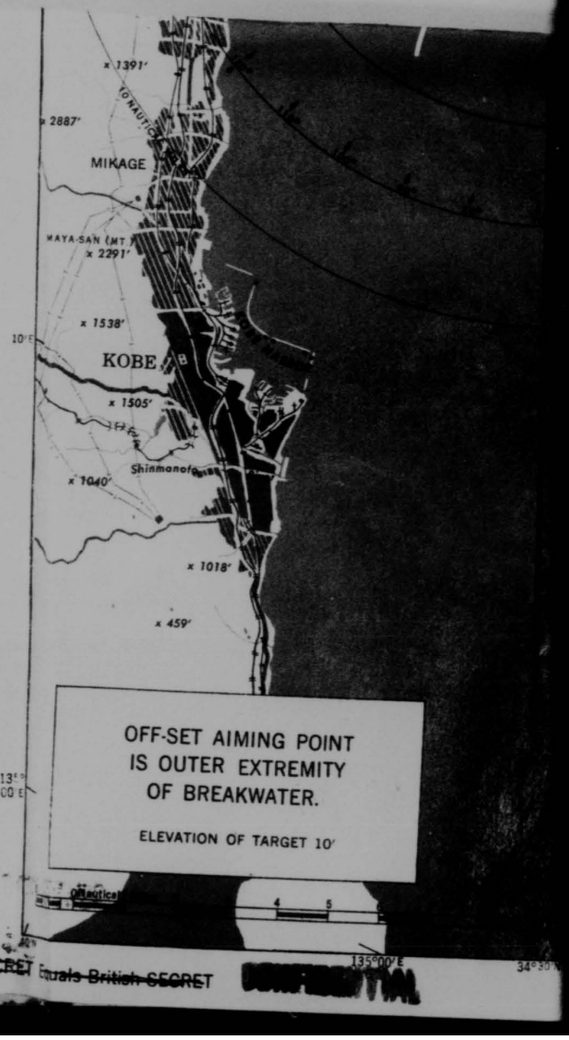
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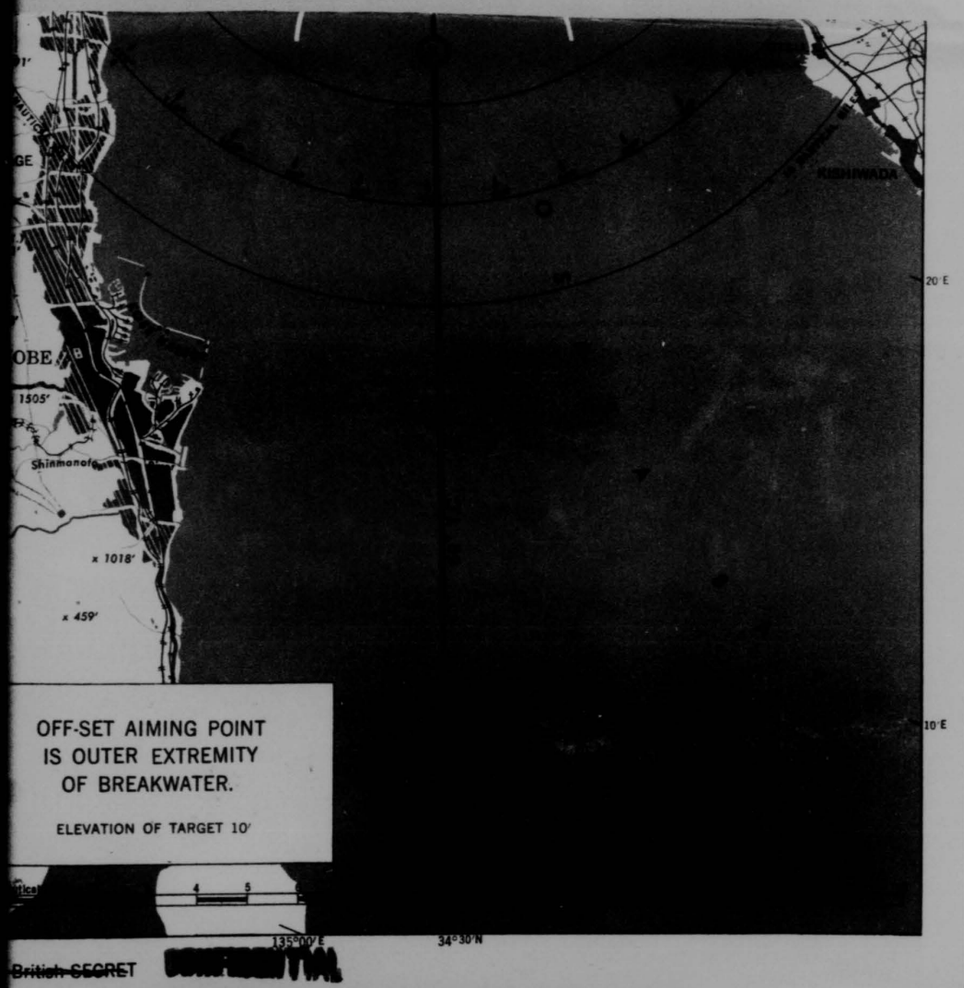
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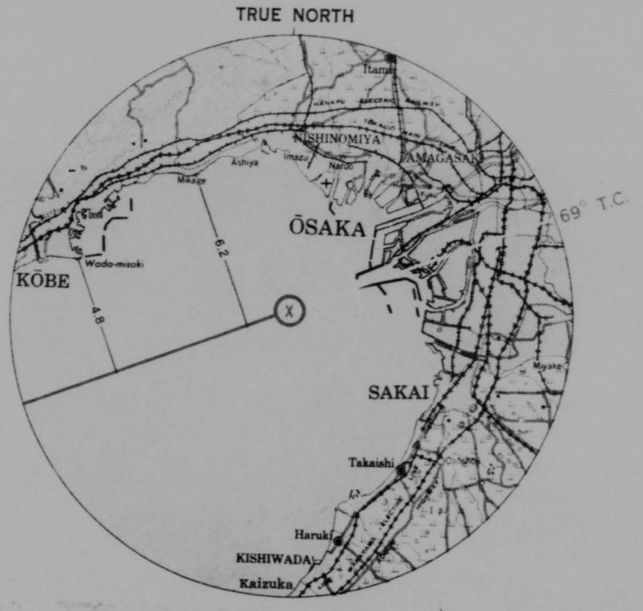
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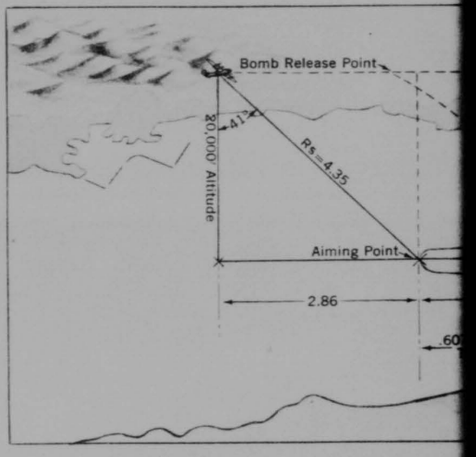
POINT X

2.86 Nautical Miles from Aiming Point

41 Degrees of Tangency



3 Dimensional Diagram of



PROCEDURE FROM I. P. TO TARGET-SYNC

1. Approach I.P. check point on course 360°T using circle set on 11.0 N.M.
2. Determine bomb release circle setting for radar di Range Tables. Have this figure ready for emergen
3. Alter course to 69°T when check point coincides sweep is still on.
4. Heading toward target is to be corrected at interva
5. Set bomb release circle on 70° and prepare for still on.
6. Synchronization is started when bomb release circ at 2° intervals until accomplished. 20-mile sweep
7. At 10 miles from A.P. change sweep to 10 miles arc. Synchronization and corrected headings are
8. Set bomb release circle for direct bombing and directed by bombardier.

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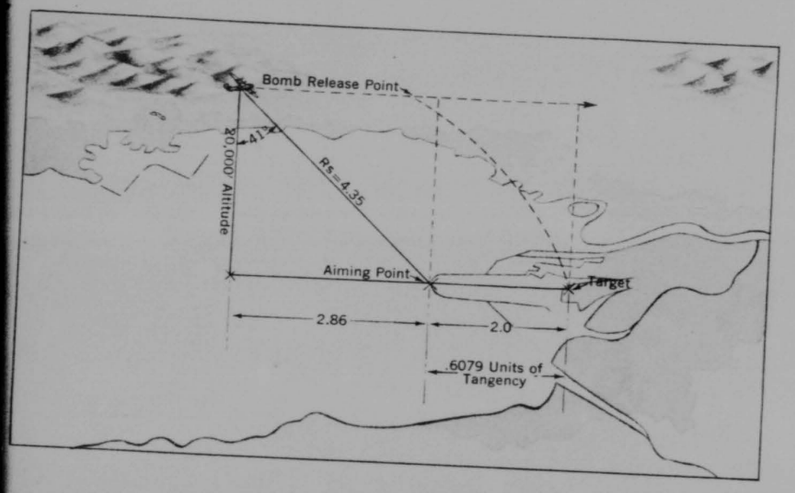
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3 Dimensional Diagram of Point "X"



PROCEDURE FROM I. P. TO TARGET-SYNCHRONIZATION METHOD

1. Approach I.P. check point on course 360°T using 20-mile sweep and bomb release circle set on 11.0 N.M.
2. Determine bomb release circle setting for radar direct bombing on target from Slant Range Tables. Have this figure ready for emergency reference.
3. Alter course to 69°T when check point coincides with bomb release circle. 20-mile sweep is still on.
4. Heading toward target is to be corrected at intervales during bomb run.
5. Set bomb release circle on 70° and prepare for synchronization. 20-mile sweep is still on.
6. Synchronization is started when bomb release circle coincides with A.P. and continues at 2° intervals until accomplished. 20-mile sweep is still on.
7. At 10 miles from A.P. change sweep to 10 miles and set sector scan on approx. 60° arc. Synchronization and corrected headings are continued.
8. **Set bomb release circle for direct bombing and be prepared to bomb by radar if directed by bombardier.**

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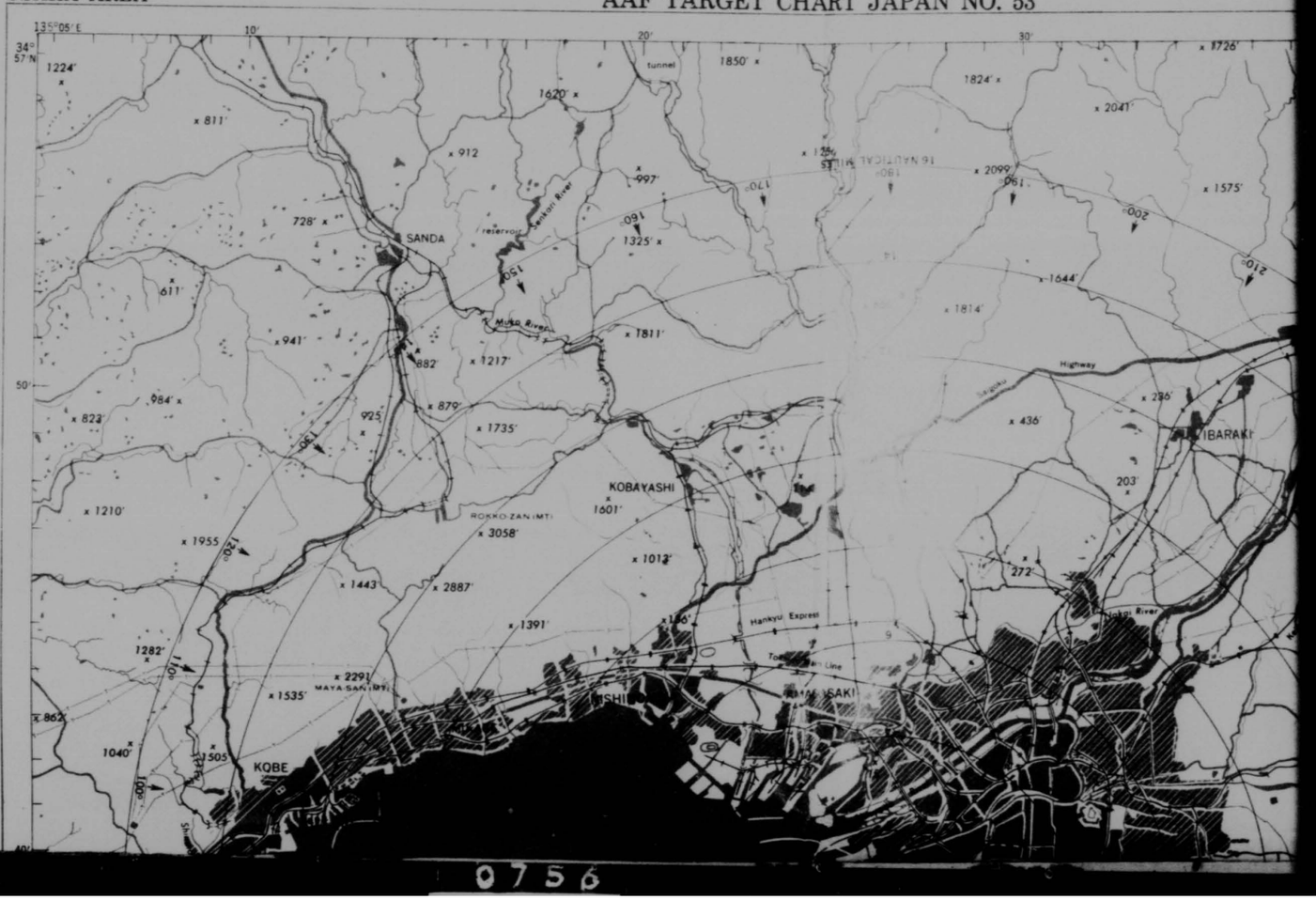
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OSAKA AREA

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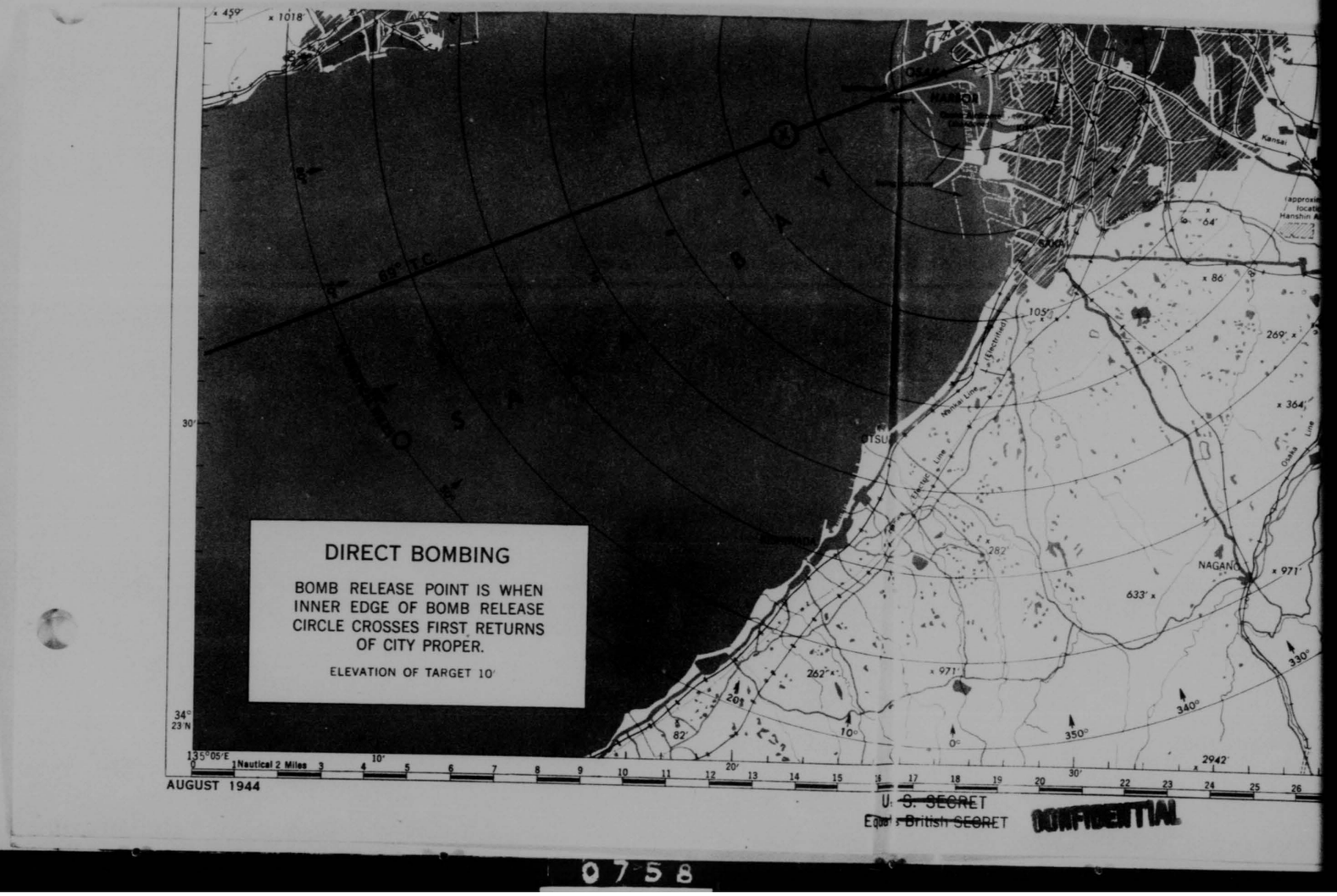


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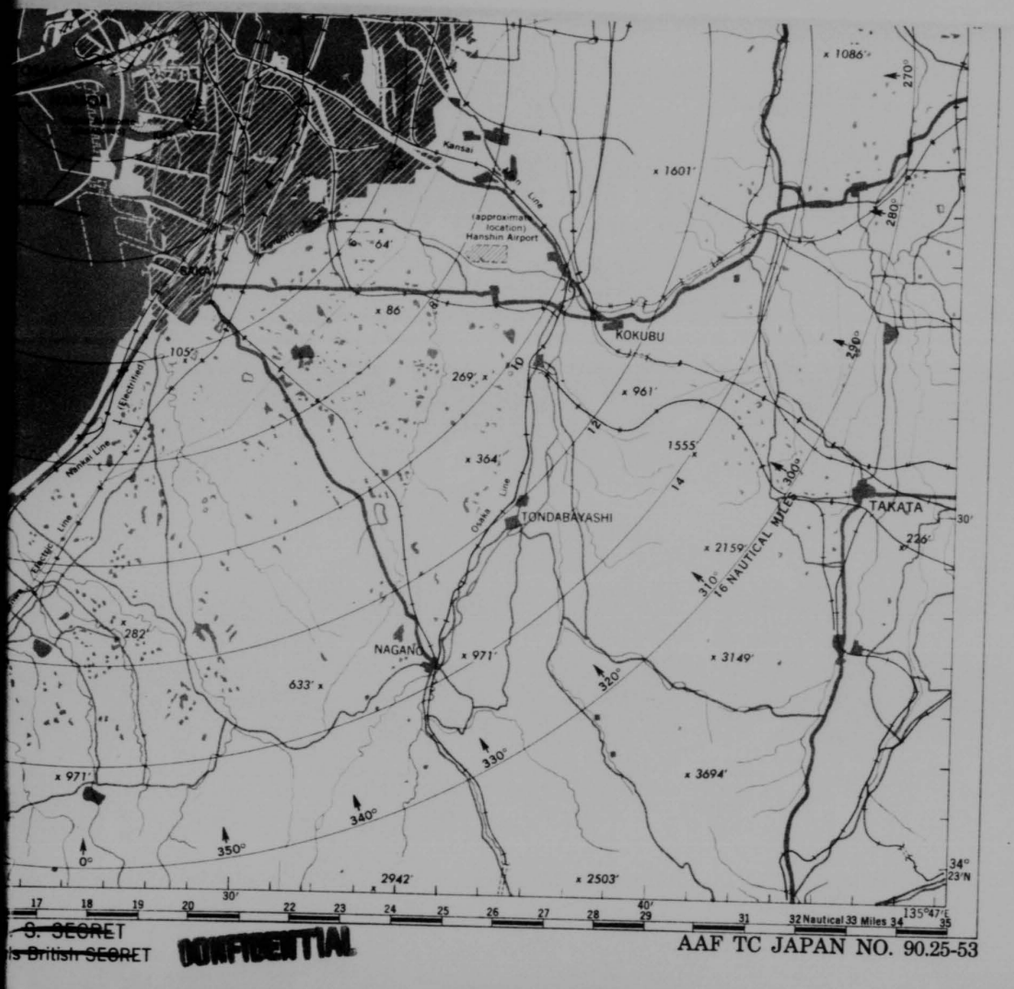


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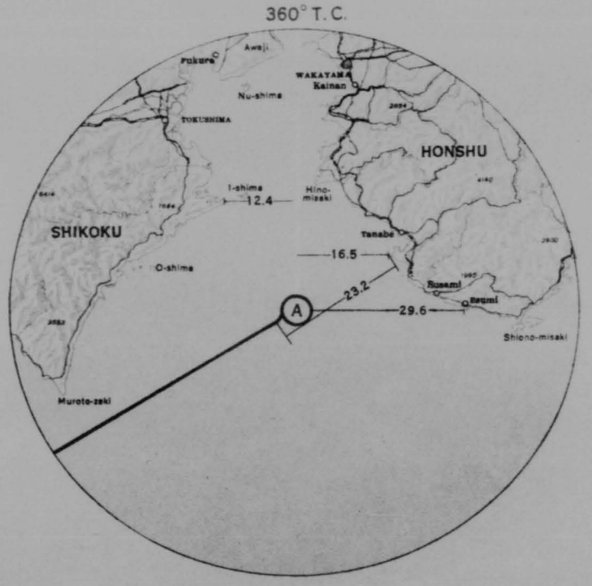
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POINT A

81 Nautical Miles from Target



50 MILE SWEEP

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36 Nautical M



50 MIL

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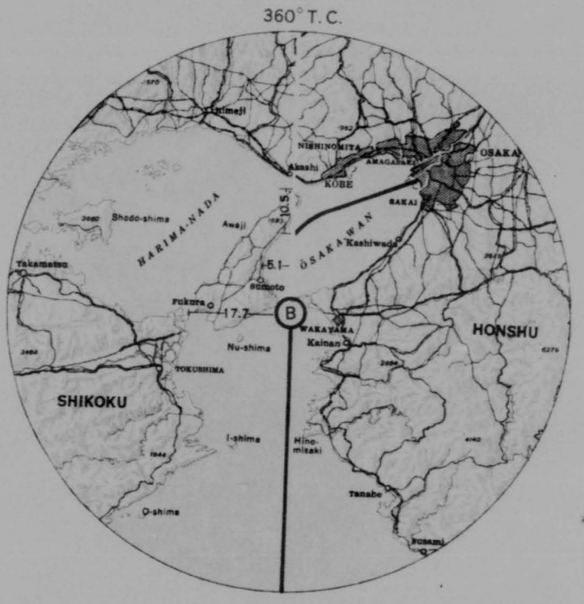
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POINT B

36 Nautical Miles from Target



50 MILE SWEEP

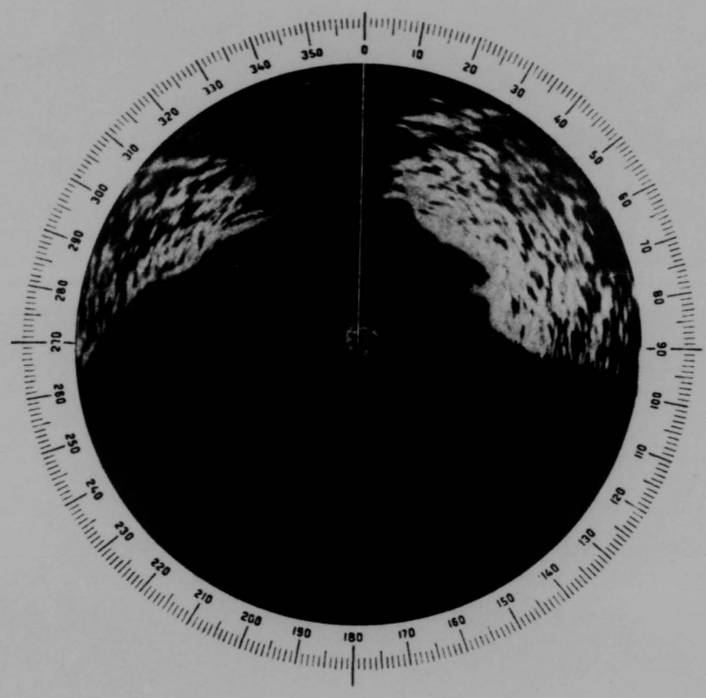
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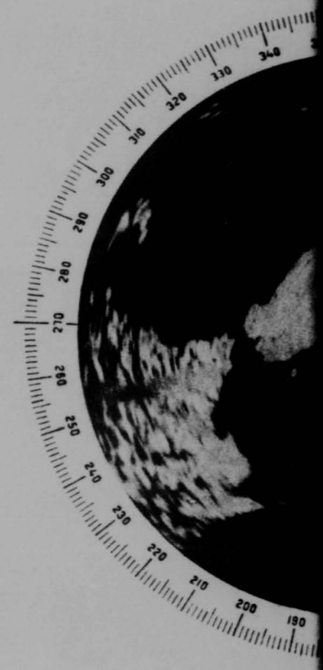
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DISTANCE TO CHECK POINTS GIVE[illegible] IN NAUTICA[illegible] MILES OF GROUND RANGE.
LUBBER LINE INDICATE[illegible] COURSE WITH "NO DRIFT."
SCOPE PICTURES USABLE [illegible]ETWEEN [illegible],000' AND 28,000'.

U[illegible]
Equip[illegible]

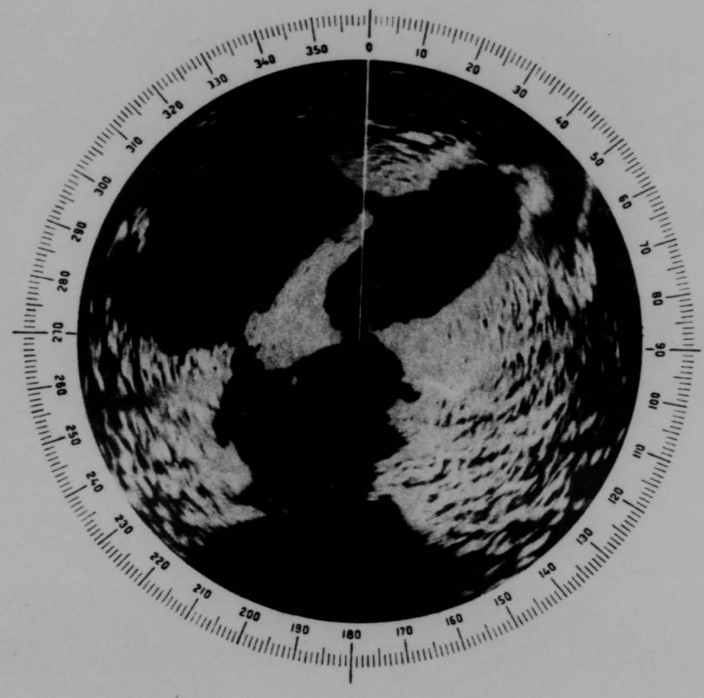
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N NAUTICAL MILES OF GROUND RANGE.
COURSE WITH "NO DRIFT."
ETWEEN 12,000′ AND 28,000′.

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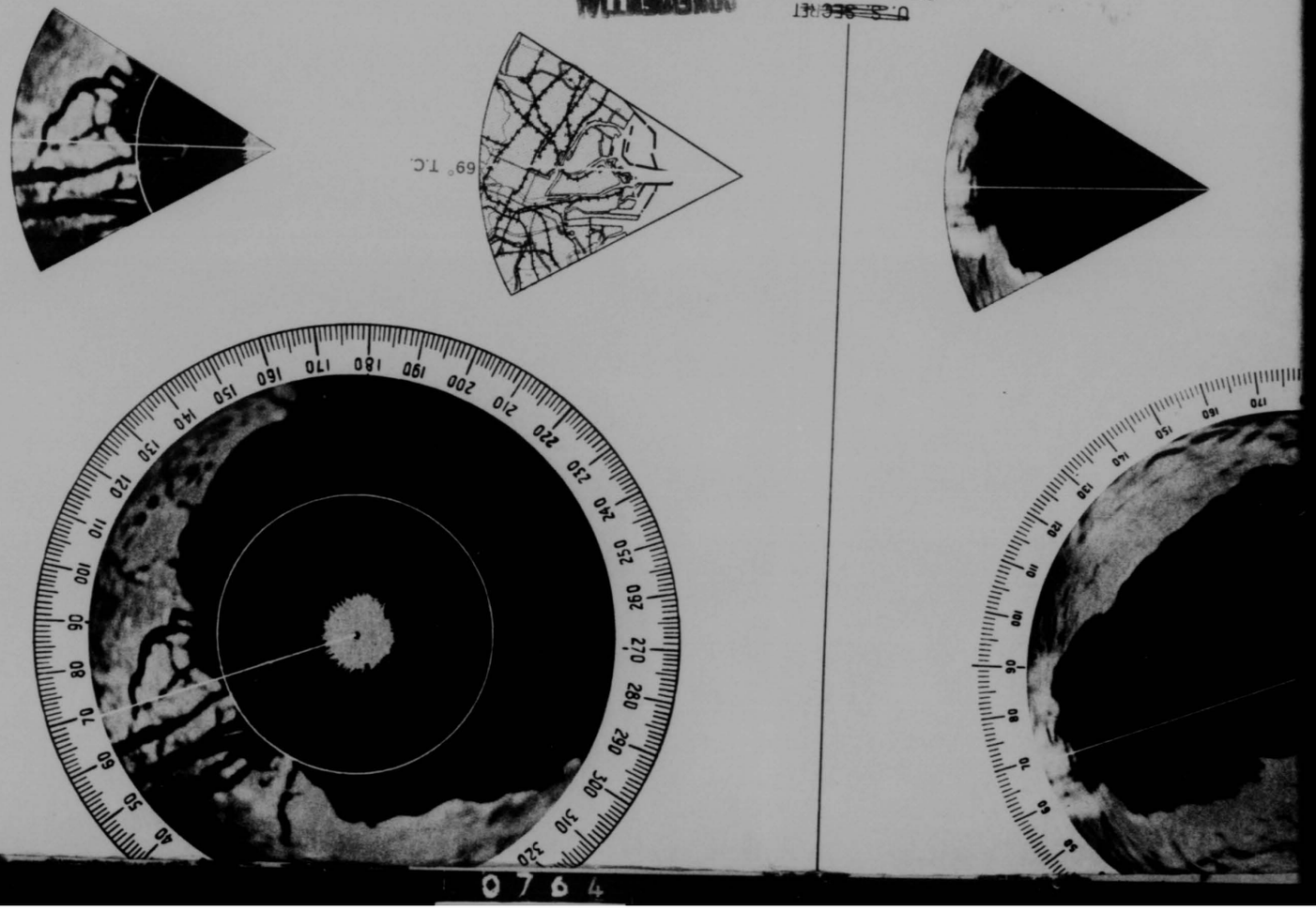
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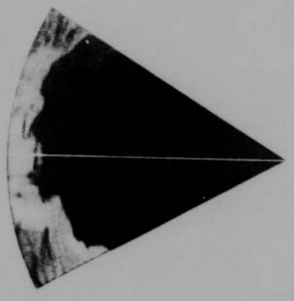


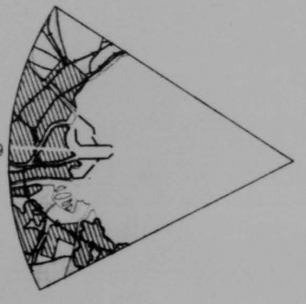
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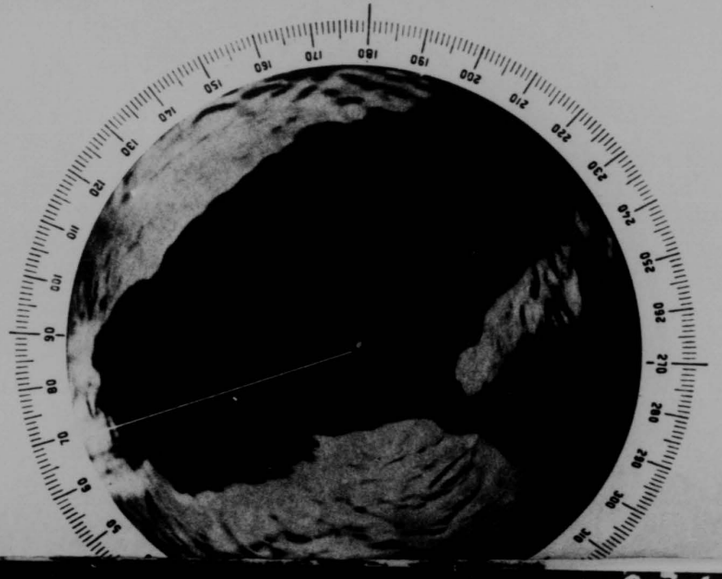
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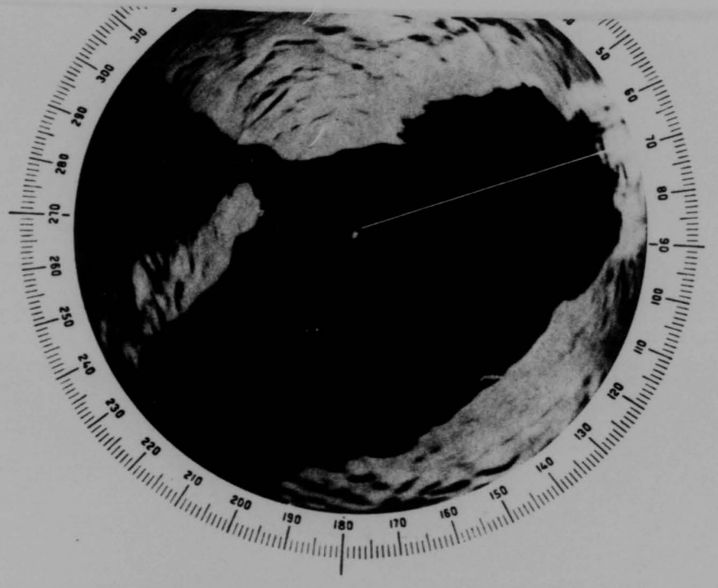


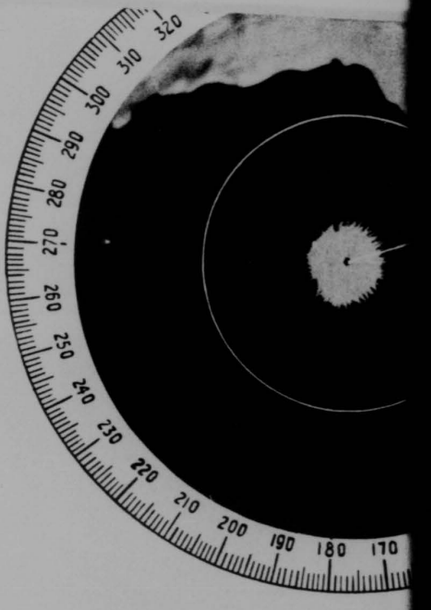
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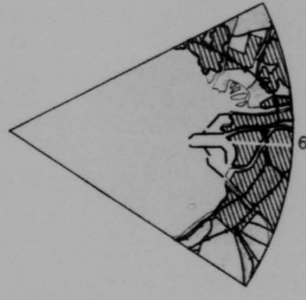
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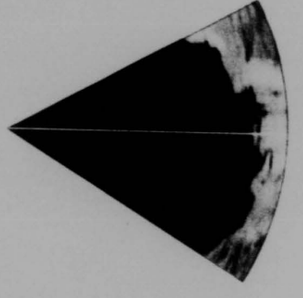
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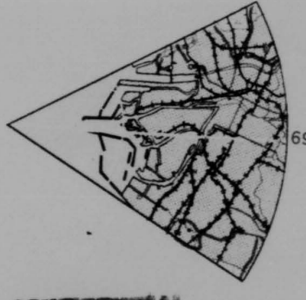
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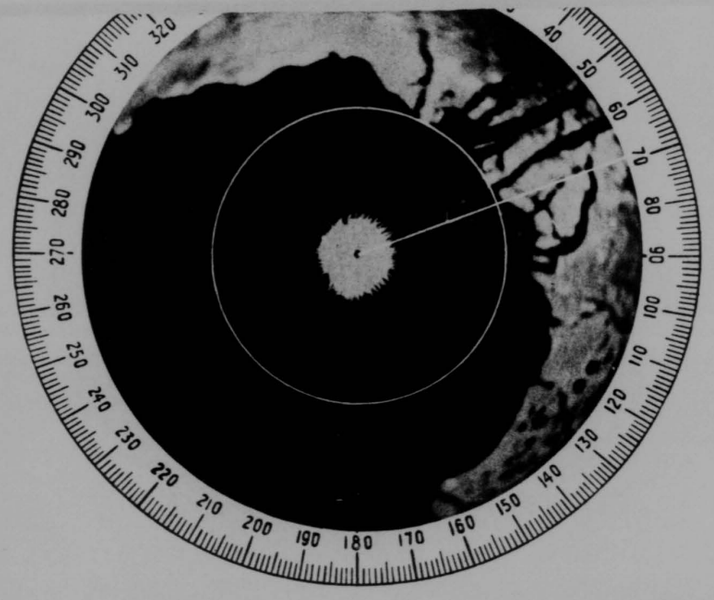
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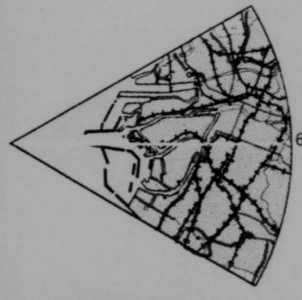
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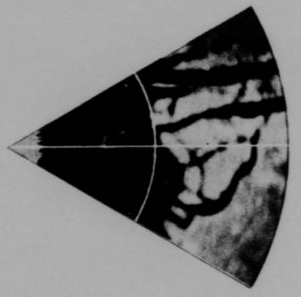
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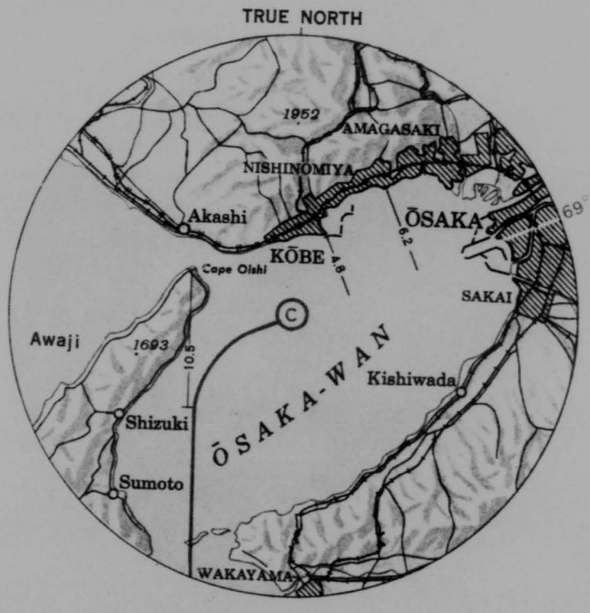
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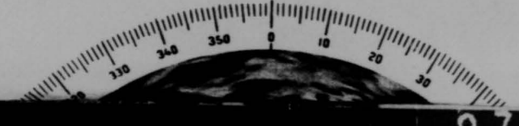
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POINT C

15 Nautical Miles from Target



20 MILE SWEEP



POINT

Bomb Release



10 MILE SW



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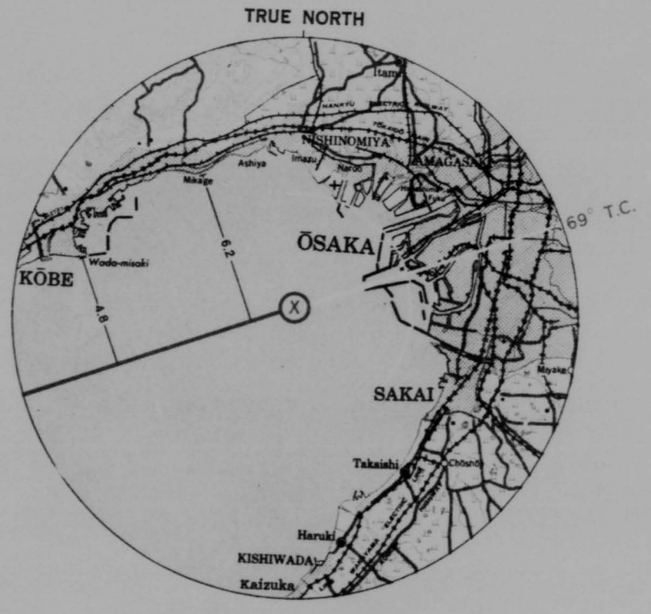
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POINT X

Bomb Release Point



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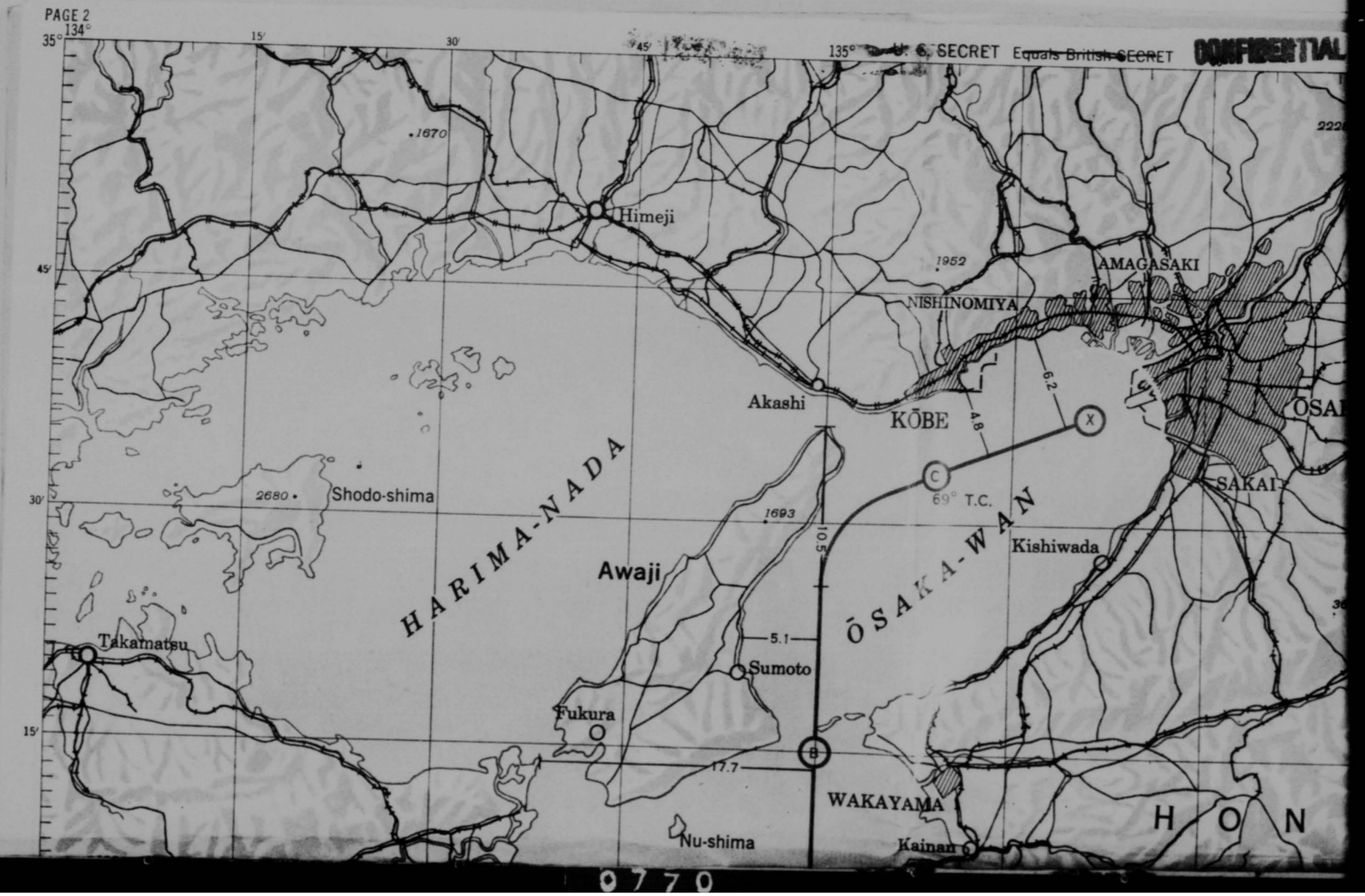
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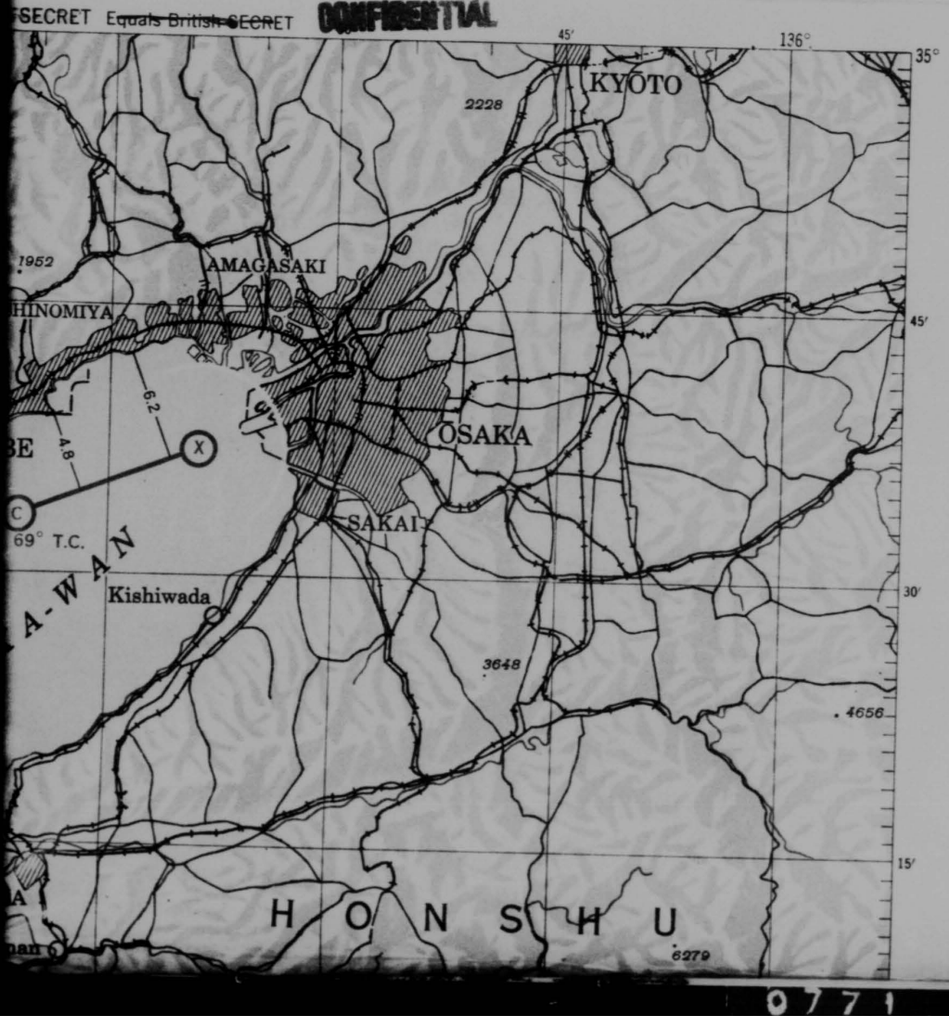
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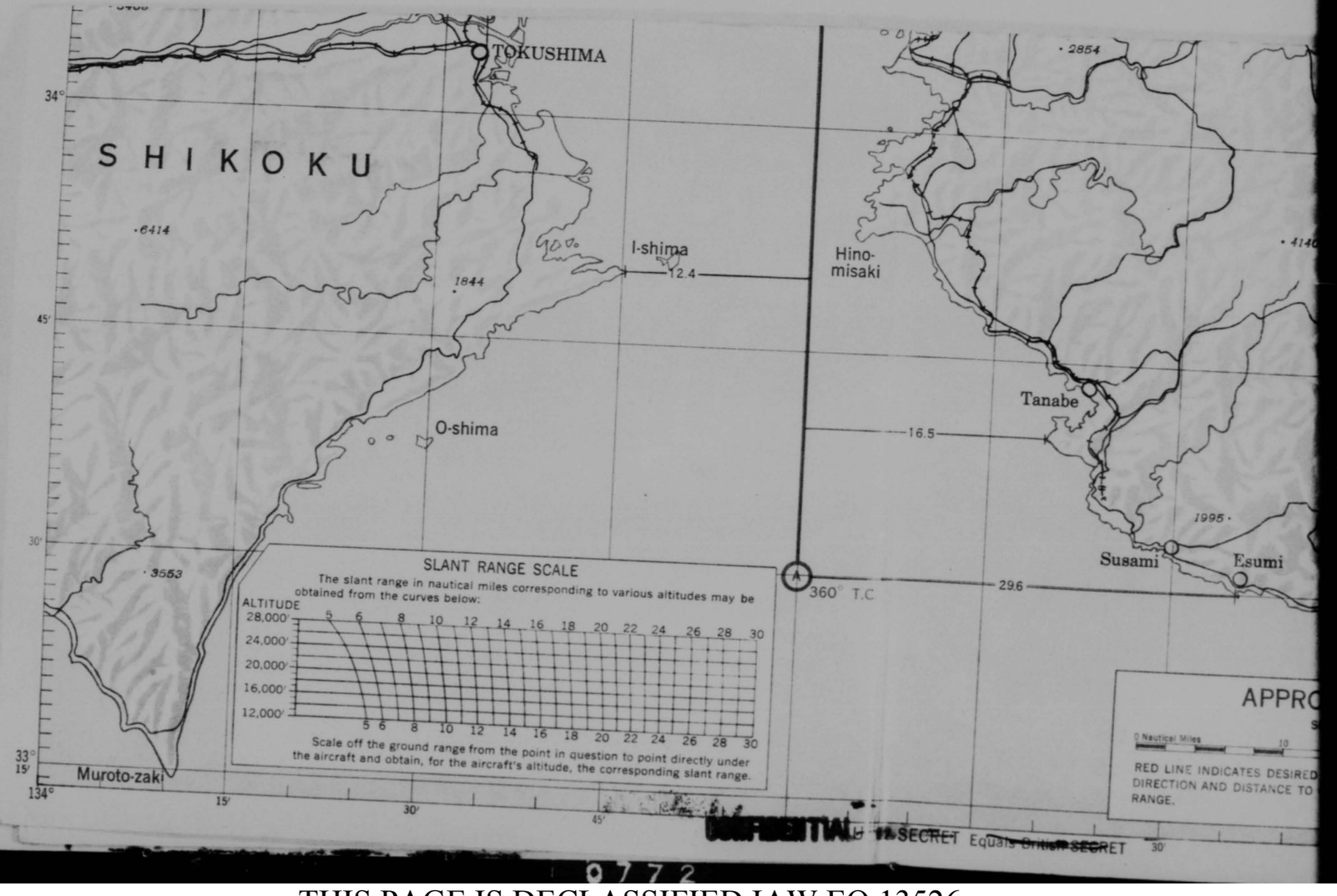


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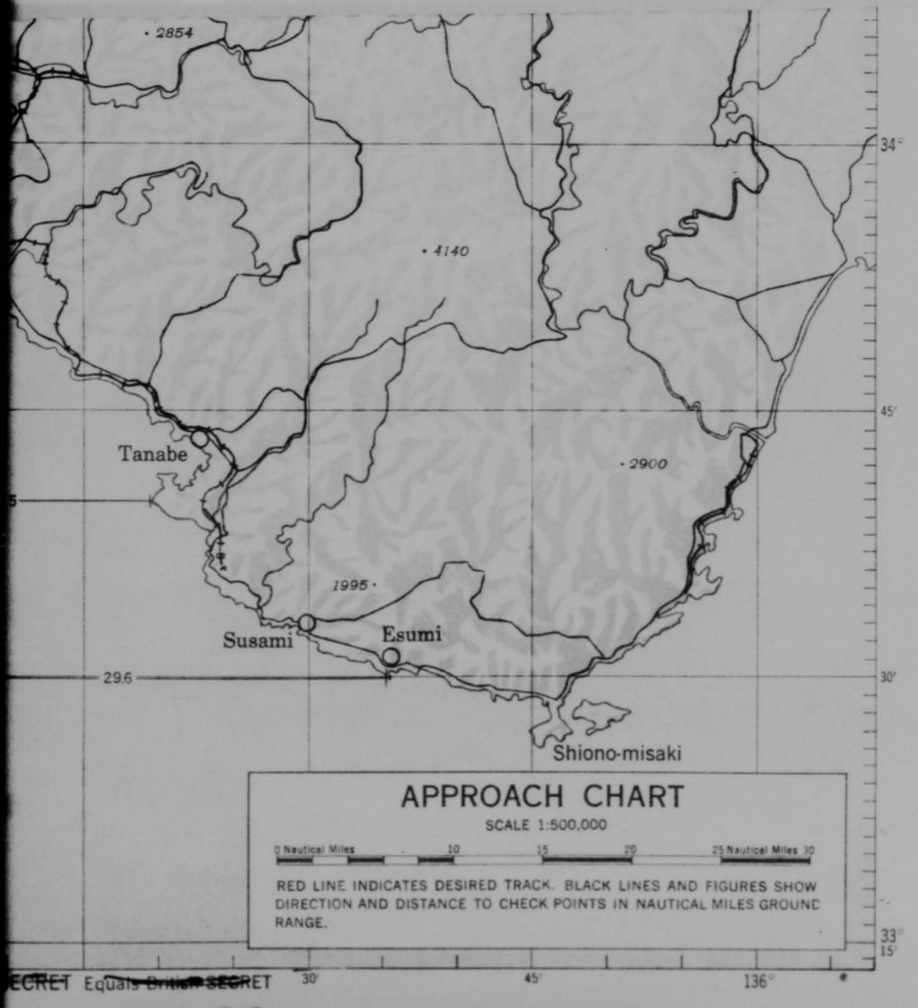
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APPROACH CHART

SCALE 1:500,000

0 Nautical Miles 10 15 20 25 Nautical Miles 30

RED LINE INDICATES DESIRED TRACK. BLACK LINES AND FIGURES SHOW DIRECTION AND DISTANCE TO CHECK POINTS IN NAUTICAL MILES GROUND RANGE.

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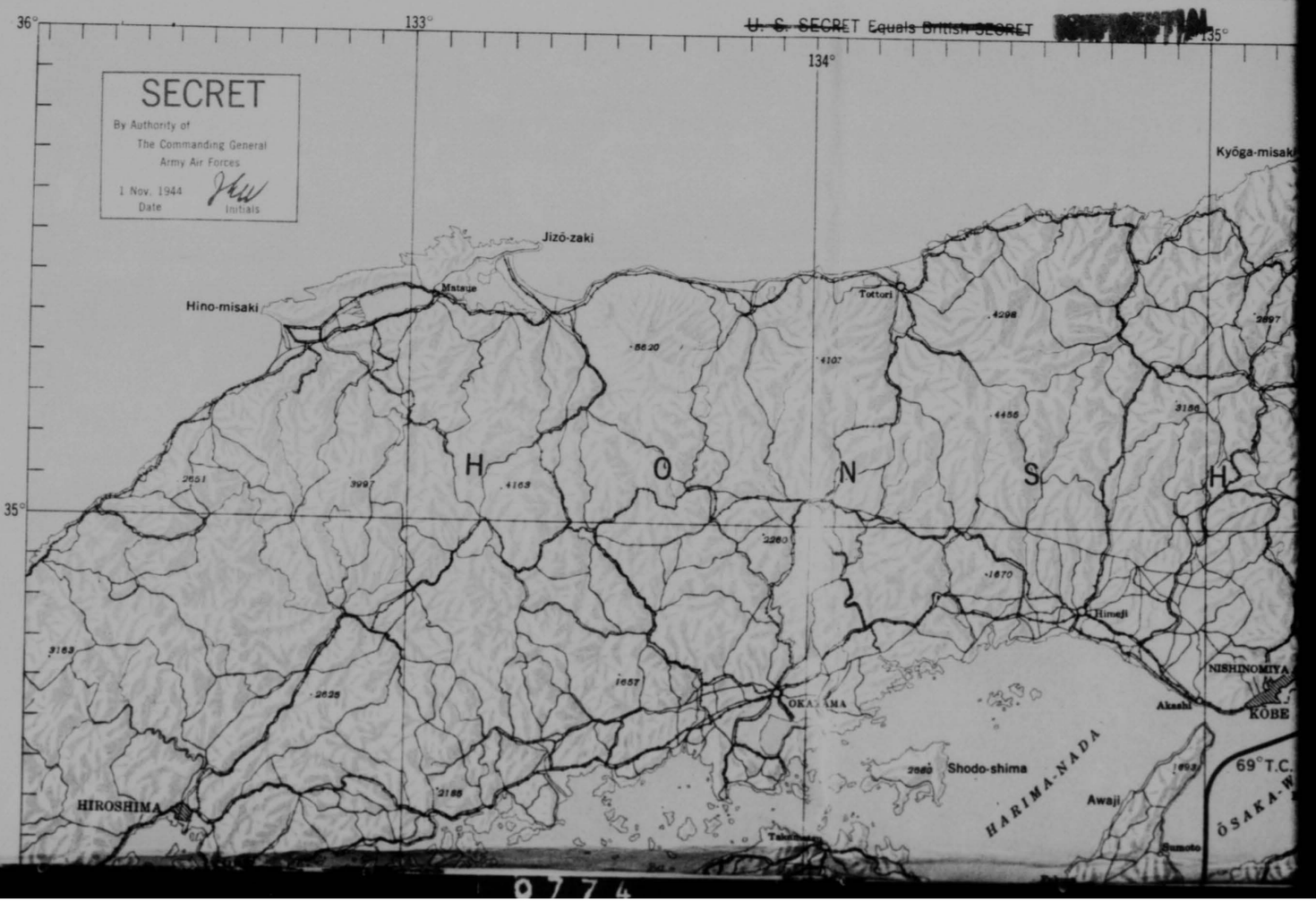
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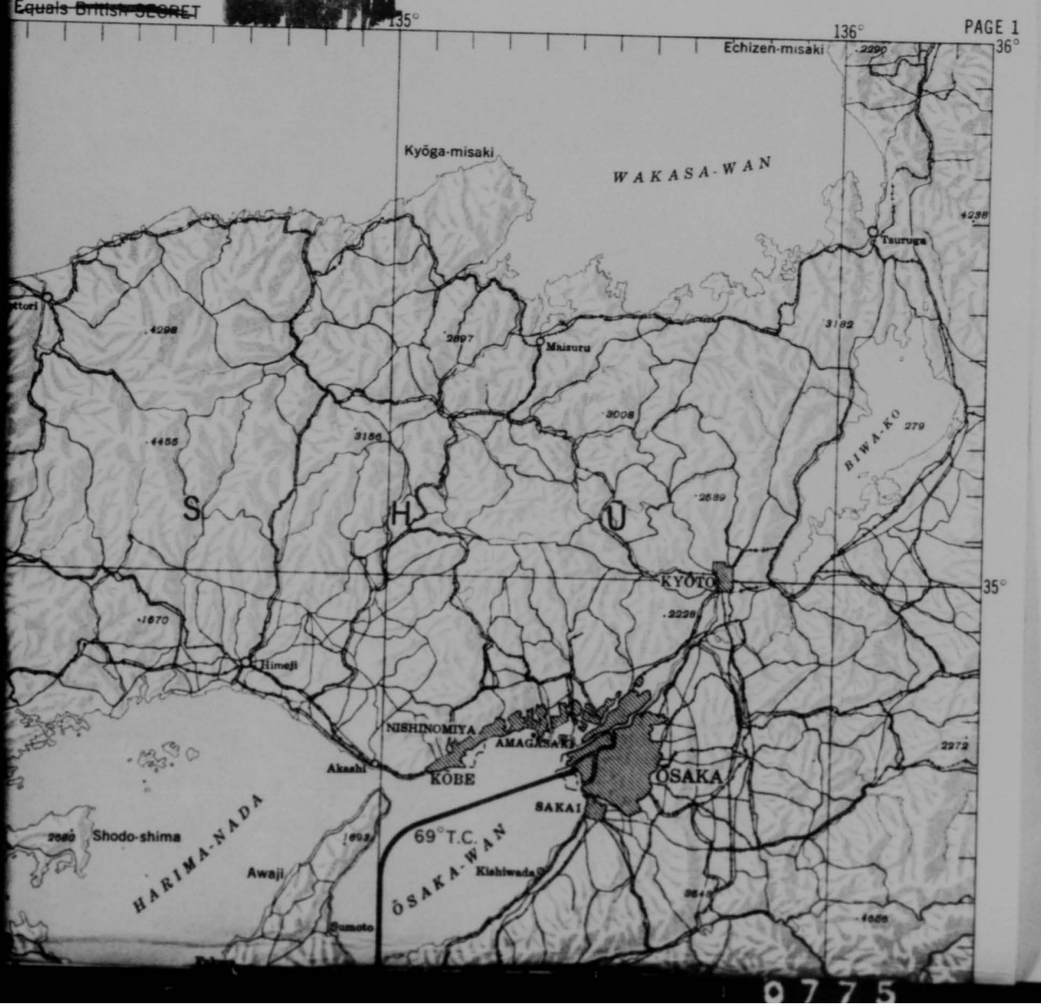
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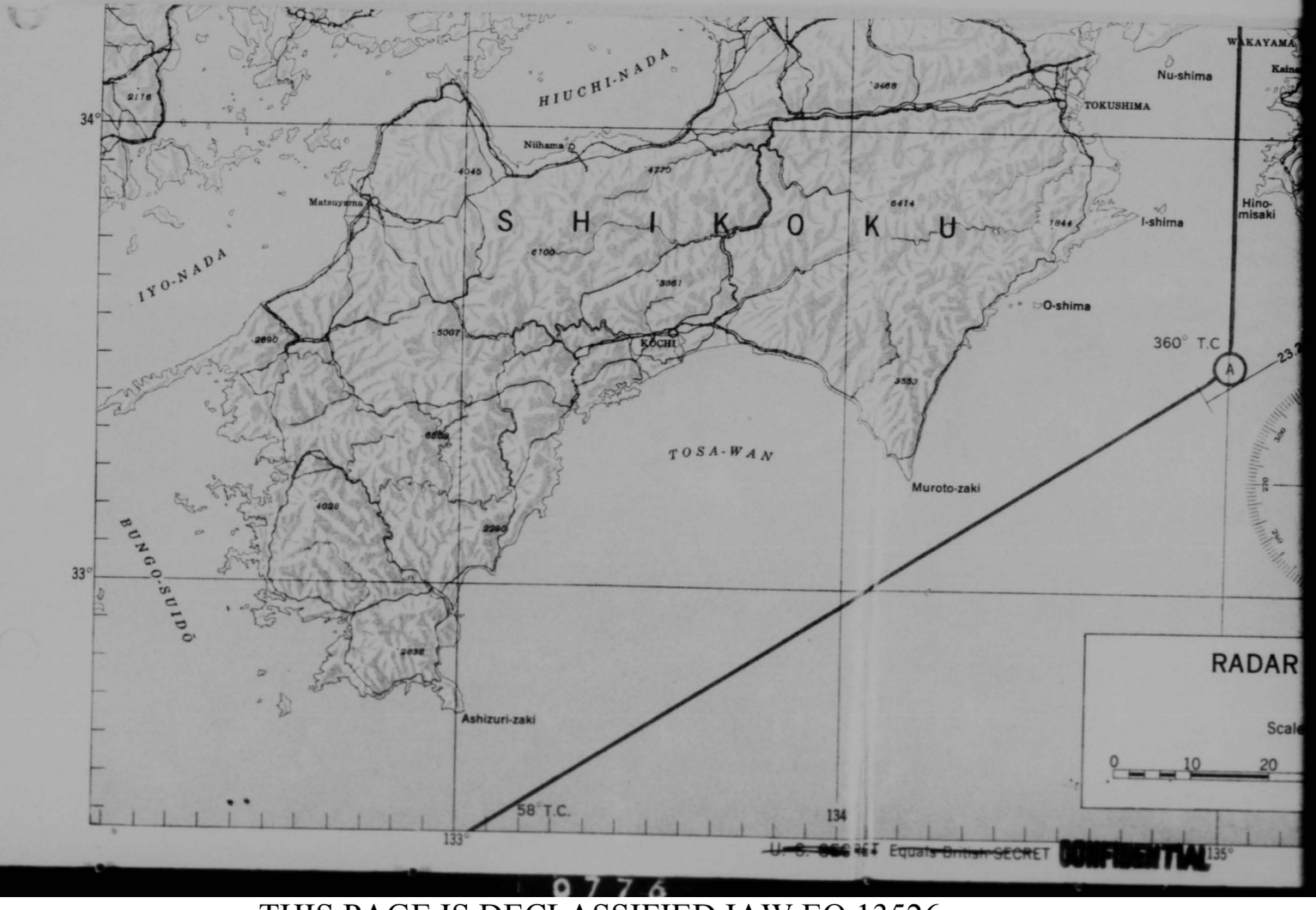


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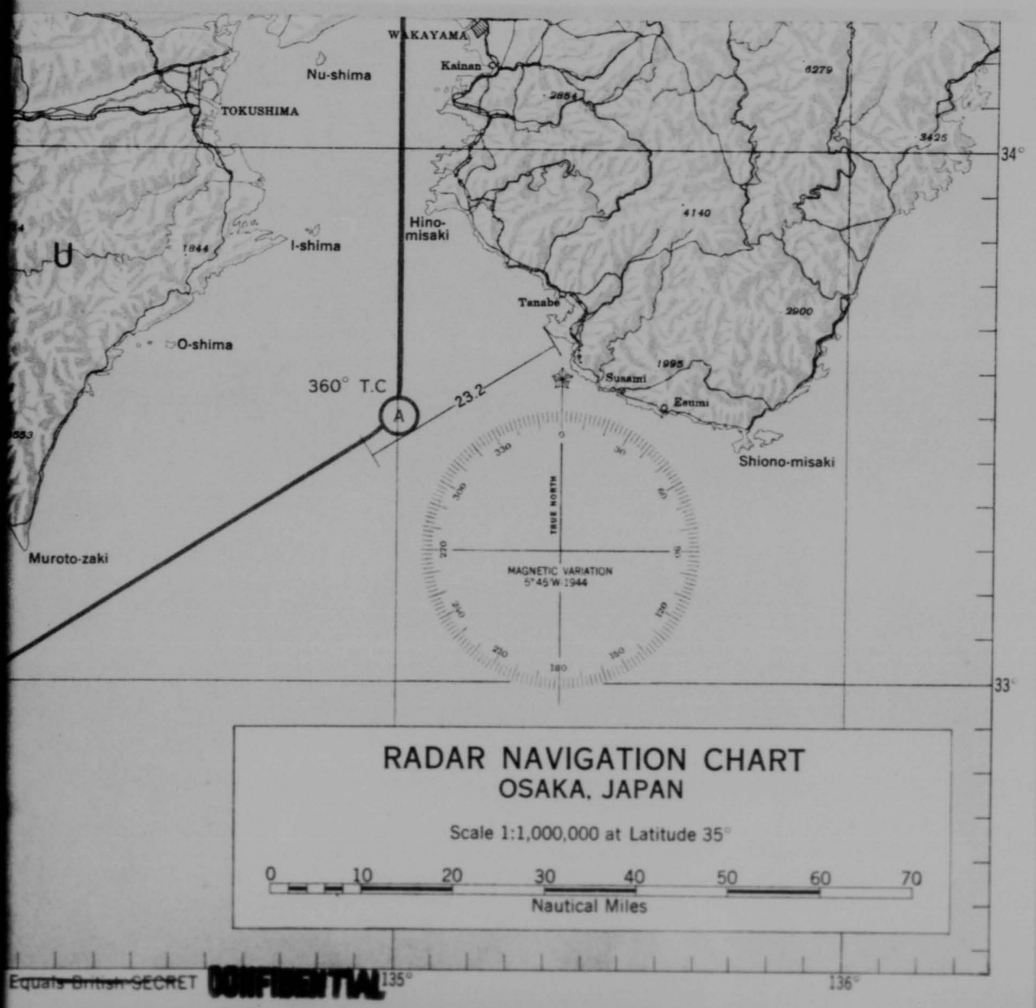
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RADAR NAVIGATION CHART
OSAKA, JAPAN

Scale 1:1,000,000 at Latitude 35°

0 10 20 30 40 50 60 70

Nautical Miles

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This is a sample RADAR OPERATOR'S TARGET FOLDER designed to suggest the most graphic and helpful manner in which to present the radar navigational and bombing data which the radar operator will take into the air.

When Radar Navigation Maps and Target Charts which are in the process of development have been completed they can be used in these folders, and as actual scope photographs become available from reconnaissance they should be used whenever possible in place of simulated scope photographs. In lieu of these items, this is an attempt to show what can best be used; even the material used in this folder has its shortcomings and they will be discussed in detail. This sample folder has combined the best features from several other folders that have been used on both operational and training flights.

IN GENERAL, radar operator's target folders should be printed in such a manner as to be visible under the fluorescent lights used at the operator's station with only nautical miles and true courses indicated and should contain:

1. Approach chart, using the finest radar navigation map available, scale 1:500,000, with the true course drawn indicating the points where scope photos were taken and distance to the best check points, and a slant range scale.
   a. To further aid the operator a radar navigation map, scale 1:1,000,000 covering the overall target area may be included which would indicate course, where to take wind run, and where to measure altitude.
4. Appropriate tables:
   a. Slant range - for either direct or sync
      of bomb being used, and allowing
      pected altitude and ground speed.
   b. McNair - for wind determination if ex
   c. Final Course Correction - if a partic
      Command to more accurately align

Three dimensional drawing showing the g

Step by Step procedure for operator from

SPECIFICALLY, the printed material which co
the general briefing is not included here because u
operator has not the time on a bombing run to w
should contain in a graphic and helpful manner th
the approach to the target. Such instructions as
Open" are omitted for it must be remembered tha
different Commands of VHB and the procedures i
all such instructions are intended for the operator.
included which are peculiar to a Command and w

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4. Appropriate tables:

   a. Slant range - for either direct or synchronized bombing technique to cover the type of bomb being used, and allowing reasonable margins on either side of the expected altitude and ground speed.

   b. McNair - for wind determination if expected drift is 6° or less.

   c. Final Course Correction - if a particular technique has been established in the Command to more accurately align the plane to the desired track.

5. Three dimensional drawing showing the geometry of the bombing problem.

6. Step by Step procedure for operator from IP to T.

SPECIFICALLY, the printed material which consists of a resume of what was presented at the general briefing is not included here because usually it is such detailed description that the operator has not the time on a bombing run to wade through such a document. His folder should contain in a graphic and helpful manner the important details he should remember on the approach to the target. Such instructions as "Take Wind Drift Here," "Bomb Bay Doors Open" are omitted for it must be remembered that copies of this folder are being sent to three different Commands of VHB and the procedures in all three as yet are not standardized. Not all such instructions are intended for the operator. However, any or all instructions should be included which are peculiar to a Command and which will insure the thorough

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2. At least four scope photos, accompanied by map inserts, located at the following points:

   a. If IP to T is approximately 50 miles
      On 50 mi sweep - 40 mi from IP
      On 20 mi sweep - just before turn at IP
      On 50 mi sweep - 40 mi from T (or AP)
      On 20 mi sweep - 16 mi from T
      On 10 mi sweep - 6 mi from T

   b. If IP to T is approximately 30 miles
      On 50 mi sweep - 30 mi from IP
      On 20 mi sweep - just before turn at IP
      On 20 mi sweep - 16 mi from T (or AP)
      On 10 mi sweep - 6 mi from T

   c. Sector Scan should be shown of the two scope photos closest to the target.

3. Target Chart, scale approximately 1:180,000, which in effect is a scope mosaic of the target area showing the pattern of persistent and reliable returns.

...all crew members on the bombing run.

The radar predictions as shown in the s... Radar Planning Device of the Special Devices... collaboration with this office. The inherent sl... cates ground range, hence slant range distorti... which will insert this distortion. Regardless, t... ligible on the 20 mile sweep or more. The pr... here were made specified the closed altitude c...

Although the scope photos used do not c... printing these were the only ones available) a R... ed and, upon request, will be distributed to Cor... simulated scope photographs which form a g... 36°45′ North and 134°00′ East to 141°45′ Eas... kit is an aid to the Radar Intelligence Unit of A... radar missions and the preparation of radar op...

No tables were included due to the lack of ...

It is requested that detailed comment on t... mediately to this office.

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all crew members on the bombing run.

The radar predictions as shown in the simulated scope photographs were made by the Radar Planning Device of the Special Devices Division, Bureau of Aeronautics, U. S. Navy, in collaboration with this office. The inherent shortcoming of the RPD scope photo is that it indicates ground range, hence slant range distortion is not present; but a method is being devised which will insert this distortion. Regardless, the slant range distortion of an RPD photo is negligible on the 20 mile sweep or more. The project for which the simulated scope photos used here were made specified the closed altitude circle, but the open circle can be simulated.

Although the scope photos used do not coincide with the ideal points desired (at time of printing these were the only ones available) a Radar Prediction Kit, 16-C-23t, has been completed and, upon request, will be distributed to Command level. This kit contains negatives of 330 simulated scope photographs which form a grid system adequately covering 30°30′ North to 36°45′ North and 134°00′ East to 141°45′ East. In the absence of radar reconnaissance, this kit is an aid to the Radar Intelligence Unit of A-2 at Bomber Command for initial planning of radar missions and the preparation of radar operator's target folders.

No tables were included due to the lack of uniformity in the various Commands.

It is requested that detailed comment on this folder from each recipient be forwarded immediately to this office.

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SELECTED AERIAL OBJECTIVES FOR RETALIATORY GAS ATTACK ON JAPAN

APRIL 1944

PREPARED JOINTLY BY
CHIEF OF THE CHEMICAL WARFARE SERVICE
THE AIR CHEMICAL OFFICER
and
ASSISTANT CHIEF OF AIR STAFF, INTELLIGENCE
WASHINGTON, D. C.

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SELECTED AERIAL OBJECTIVES FOR RETALIATORY GAS ATTACK ON JAPAN

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IV. Nagoya

V. Osaka

VI. Yawata

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3. Nagoya
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6. Yawata-Tobata-Wakamatsu
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FOREWORD

This study is an analysis of conditions affecting retaliatory gas attack by the USAAF. Such a program has important limitations on its scope. Within the framework of these limitations, both the air effort necessary for effective retaliation, and a number of Japanese cities which offer suitable strategic targets, have been studied. The conclusions which have been reached are subject to modifications in the light of future developments and further experience with the means by both the USAAF and the CWS, but it is believed that they provide a reasonable basis for outlining a retaliatory gas attack program.

The report has been prepared jointly by the Chemical Warfare Service, the Air Chemical Officer, and the Assistant Chief of Air Staff, Intelligence. The Chemical Warfare Service is primarily responsible for those parts of the report dealing with capabilities of gas munitions, force requirements etc. The Air Chemical Officer is primarily responsible for those parts dealing with bomb loads, number of planes required etc. Assistant Chief of Air Staff, Intelligence has selected the cities designated as targets and has furnished the descriptions of these cities and geographical studies found in the report.

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REPORT

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THE FEASIBLE AIR ATTACK

PART I

A. Assumptions.

1. Use of gas by the United Nations will start on a day (G Day) which will be the day our forces begin to use gas in retaliation. From G day until such time as this amount of effort ceases to be profitable (the initial phase), an all out retaliatory effort will be made. This will be succeeded by routine gas warfare. This program deals with the initial phase.

2. The entire bomber strength based on China, the Pacific Islands north of the Equator, the Philippines, Formosa and Aleutians will be assigned to the retaliatory gas attack program. Since the United Nations now hold no bases from which the selected targets can be reached (except possibly by the VLR bombers which have not yet become operational), it is impossible at this time to predict the bases from which the attack can be launched. Under the circumstances of the continuance of hostilities in Europe no accurate forecast of the availability of planes and chemical munitions for this program can be made. It is considered to be a reasonable assumption that planes, munitions and bases sufficient to lay down the concentrations desired on targets in pursuance of this program will be available when the decision is made to proceed.

3. To obtain maximum striking power, aircraft will be used during the initial phase at 150% of the average monthly mission rate.

4. The weight of the bomb load carried during the initial phase is estimated to consist of 75% gas and 25% HE.

5. To attack one square mile of target area will require:

   a. For persistent (mustard) gases 4,000 U.S. standard 100 lb. bombs.

   b. For nonpersistent (phosgene or CC) gases 600 U.S. standard 1,000 lb. bombs (for 500 lb. bomb requirements, see Table I).

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TARGET SELECTION CONSIDERATIONS

PART II

A. Assumptions.

1. Other studies are being made by the Air Chemical Officer and the Chief of the Chemical Warfare Service of tactical targets in the tropical areas leading up to the Japanese mainland. The matter of areas occupied by Japanese forces for tactical purposes where the native population is not appreciably concentrated is therefore not considered here.

2. The gas attack program is aimed primarily at causing the maximum number of casualties, crippling transportation and public services, complicating and delaying the repair of HE bomb damage and making targets more vulnerable to incendiary attack.

3. Target selection should be concentrated on Japanese cities which contain densely populated sections and are the location of important war activities so as to achieve the greatest possible effect.

4. The most suitable times for nonpersistent gas attacks are when conditions of inversion may be expected. The most suitable times for persistent gas attacks are when the temperatures are highest. If gas attacks are made during the day, the most congested part of the city would be the central business and high density residential and industrial districts. If the attack is made at night, the high density residential district will be preferred.

5. The minimum force to be used in attacking targets in Japan is approximately two groups of ninety six (96) planes of presently operational heavy bombers (B-17's and B-24's) since VLR aircraft (B-29's and B-32's) have not been proven operationally, no attempt has been made to define the minimum force of these airplanes which will be necessary. Regardless of the type of airplane used, sufficient force to cover the area of one square mile is considered the minimum.

6. No allowance is to be made for damage by HE or incendiary bombing, or for Japanese efforts at evacuation of the selected cities, since these factors will have to be determined in the Field prior to G Day.

B. Importance of Potential Targets.

1. Ten cities in Japan proper, in four concentrations have been analyzed as potential targets. These were selected because they include densely settled districts and important war industries. The significance of these cities may be judged by the fact that they include approximately 60% of the urban population of Japan, more than 20% of the total population of the main Japanese Islands, over half of the priority targets, more than half of the key and priority targets selected for air attack, Japanese Target Data, March 1943 prepared by AC/AS Intelligence and are selected as the most important cities for incendiary attack in Incendiary Attack Data, October 1943, prepared by AC/AS Intelligence. A list of the key and priority targets in each city follows the detailed description in App. . This list is given to indicate the importance of the city and the war industries which will be affected by attack on the population.

C. Distribution of Potential Targets.

1. As will appear hereafter, the ten selected cities fall into four compact groups. The area around Tokyo includes the city of Tokyo itself and adjoining cities Yokahama, Kawasaki and Yokosuka. The area around Osaka, includes that city, Kobe and Amagasaki. The third area

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includes Nagoya and its suburbs. The fourth area in Northern Kyushu includes Yawata, Kokura and Tobata. None of these areas are within range of presently operational bombers. Since the course of the war, and the success of the United Nations in solving logistic problems will determine the bases from which a retaliatory air attack program can be launched, it is now impossible to predict accurately what bases will be used. The distances given below are shown merely as a guide to planning.

City	A From Northern China (Chengtu)	B From Marianas (Saipan)	From Philippines (Aparri-Northern Luzon)
(1) Tokyo	2100	1460	1630
(2) Nagoya	1940	1480	1490
(3) Osaka	1860	1483	1410
(4) Yawata	1595	1590	1205

D. Factors Determining Target Selections and Their Relative Importance.

1. The determining factors in the selection of targets are:

a. The effect on population.
b. The effect on Japanese industrial war efforts.
c. The terrain or topographic conditions surrounding the target.
d. Climate.

Factors a and b indicate which targets can be most profitably attacked while factors c and d determine the effect of successful attack.

2. Since all of the cities selected as targets in this report are located on the coast and lie in the same climatic belt in Japan proper, and therefore have generally the same topography and climate, the desirability of attacking any one of these cities will depend on the relative importance of factors a and b above at the time of the proposed attack.

3. All except d of these factors are reasonably stable. Terrain and topographic conditions surrounding the target will be constant. The concentration of industry will doubtless remain substantially the same even if the selected cities are subjected to heavy HE or incendiary bomb attack prior to the beginning of the retaliatory gas attack program since experience in Europe has indicated that under war conditions, it is quite difficult to move damaged industrial plants and the tendency in all countries is to rebuild at the old location even where plants are almost totally destroyed.

4. Liquid mustard is readily absorbed by wood which is almost impracticable to decontaminate. Since most Japanese cities are congested predominately with structures which are low and wooden, an attack on a city with a sufficient number of bombs filled with mustard, will probably greatly impair the war effort in that area.

5. Heavy damage to the selected cities may result in the removal of a part of the population but as long as the industries themselves are not moved it will be necessary for large numbers of civilians to remain in the vicinity of the plants at which they work. The requirements for transportation, public services, etc., will probably prevent the evacuation of a large part of the population from the cities.

6. Climate indicates the probability of weather conditions favoring gas attack. Climatic conditions are subject to considerable day by day variation and are the least predictable of all of the factors considered.

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TABLE I

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TABLE I

Estimate of the Number of Aircraft Required
to Attack a One Square Mile Target

with

Persistent and Nonpersistent Gas*

1. The optimum amount of gas that should be used against one square mile of target area is estimated at:

(a) 4,000 U.S. Standard one hundred pound bombs for mustard gas.

(b) 600 U.S. Standard one thousand pound bombs or 1,200 U.S. Standard five hundred pound bombs for phosgene or CC gas. **

2. The bomb load of B-17 and B-24 aircraft is assumed to average 2.5 tons. The following estimated gas bomb capacity of these heavy bombers indicates that near capacity load of both nonpersistent and persistent gases would be operationally feasible.

3. Planes Required to Carry:

(a) 4,000 mustard gas bombs (100 lb. size) - 96 B-17's
- 77 B-24's

(b) 600 nonpersistent gas bombs (1,000 lb. size)
100 B-17's or B-24's

4. For purposes of this report, the number of planes required to attack a one square mile target with gas will be estimated at:

100 heavy bombers or approximately two groups.

---

* Mustard gas bombs are available in adequate quantity. Nonpersistent gas bombs are beginning to become available.

** In order to obtain surprise effects by putting a large part of the target in crash areas (CWS T of O ltr #14, 15 May 1944), an ammunition expenditure should be considered of 900 1000-lb. bombs or 1500 500-lb. bombs, per sq. mi. The figures given assume an optimum pattern of bombing. For a point target, a 1000-lb. bomb will set up a higher concentration in the immediate area of the bomb burst and is therefore preferred. In order to create a gas cloud of relatively equal effect, twice the number of 500-lb. bombs as 1000-lb. nonpersistent gas bombs are required.

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POTENTIAL RESULTS OF ATTACK

Part III

Since gas warfare on the scale outlined in the present program has never been tested, emphasis must be placed on the fact that the results of any target program can be stated only in terms of potential effect. The paragraphs following outline the possible effect on civilian population and the Japanese war effort of attack on the ten selected target cities:

A. Potential Results of Attack on Civilian Population.

The total population of the selected target cities is in excess of 14½ million, which represents about 60% of the urban population and a little less than one-quarter of the total population of Japan Proper. All of the population of the selected cities would be exposed to the effects of the attack, about 30% would be directly affected if attack is confined to Zone 1 and nearly 70% of the population would be directly affected if Zones 1 and 2 are attacked.

B. Potential Results of Attack on the Japanese War Effort.

Attack on the selected target cities would affect the Japanese war effort through: (a) inflicting casualties upon a large proportion of the workers, (b) damaging and rendering unusable (with persistent gases) war production plants and communication and transportation facilities.

The selected cities are the locations for: (a) 109 out of 135 key and priority targets selected by AC/AS, Intelligence in Japanese Target Data, March 1943, located in 23 principal cities in Japan. Consequently if 13 additional cities were added only 26 additional key and priority targets would be subject to gas attack. (b) About 35% of all targets selected by AC/AS, Intelligence in the 23 most important industrial cities in Japan.

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TABLE 2

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SUMMARY OF GAS BOMBING DATA FOR SEVEN CITIES

TABLE 2

City	Total City Population	Area of Vulnerable Zones (Square Miles)			Number of M70 Persistent Gas Bombs			Number of Nonpersistent Bombs *		
		I	II	Total	I	II	Total	I	II	Total
Tokyo	6,779,000	10.9	56.6	67.5	43,600	226,400	270,000	6,540	33,960	40,500
Yokohama	968,000	1.0	6.4	7.4	4,000	25,600	29,600	600	3,840	4,440
Kawasaki	301,000	2.3	2.3	4.6	9,200	9,200	18,400	1,380	1,380	2,760
Osaka	3,252,000	11.2	28.2	39.4	44,800	112,800	157,600	6,720	16,920	23,640
Kobe	967,000	3.6	6.7	10.3	14,400	26,800	41,200	2,160	4,020	6,180
Nagoya	1,328,000	5.6	15.2	20.8	22,400	60,800	83,200	3,360	9,120	12,480
Yawata 1/	434,000	2.0	2.5	4.5	8,000	10,000	18,000	1,200	1,500	2,700
TOTALS	14,029,000	36.6	87.9	154.5	146,400	471,600	518,000	21,960	70,740	92,700

1/ Includes Tobata, Kokura and Wakamatsu.

* Calculated as 1,000 lb. bombs. To determine quantity 500 lb. bombs required to cover these areas, See Table I relative to effectiveness of each type bomb.

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Nagoya	1,328,000	5.6	15.2	20.8	22,400	60,800	83,200	3,360	9,120	12,480
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TOTALS	14,029,000	36.6	87.9	154.5	146,400	471,600	518,000	21,960	70,740	92,700

1/ Includes Tobata, Kokura and Wakamatsu.

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TABLE 3

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ZONE ANALYSIS OF SEVEN JAPANESE CITIES

TABLE 3

City	Total Population of City	Area of Vulnerable Zones			Area of Vulnerable Zones per 100,000 pop.			Population of Vulnerable Zones (in 1000's)			Average Population Density in Vulnerable Zones			Percent of City Population in Vulnerable Zones		
		I	II	Total	I	II	Both	I	II	Total	I	II	Both	I	II	Both
Tokyo	6,779,000	10.9	56.6	67.5	0.16	0.84	1.00	1,108	3,248	4,356	103,000	55,000	65,000	16%	48%	64%
Osaka	3,252,000	11.2	28.2	39.4	0.34	0.87	1.21	996	1,538	2,534	81,000	60,000	64,000	31%	47%	78%
Nagoya	1,328,000	5.6	15.2	20.8	0.42	1.15	1.57	364	608	972	65,000	40,000	47,000	27%	46%	73%
Yokohama	968,000	1.0	6.4	7.4	0.10	0.66	0.76									
Kobe	967,000	3.6	6.7	10.3	0.37	0.69	1.06	374	402	776	104,000	60,000	76,000	39%	41%	80%
Yawata 1	434,000	2.0	2.5	4.5	0.46	0.58	1.04									
Kawasaki	301,000	2.3	2.3	4.6	0.76	0.76	1.52									
TOTALS	14,029,000	36.6	117.9	154.5				2,842	5,796	8,638						
AVERAGES																

1 Includes Tobata, Wakamatsu and Kurosaki

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APPENDIX A

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EFFECT OF CLIMATE ON TARGET SELECTIONS

GENERAL - I

1. Weather conditions at the target are critical factors in determining the success of gas attack and the type of munitions (persistent or nonpersistent) to be used. The various weather factors affect the use of each type of gas munitions differently. Weather factors affecting the use and potential success of persistent and nonpersistent gases are not the same.

2. Satisfactory temperatures for the use of persistent gases are 60° Fahrenheit and higher. At temperatures below 50° Fahrenheit, the use of mustard gas (the principal persistent gas) is not recommended, but low temperatures do not significantly affect the use of nonpersistent gases. Rainfall washes away both persistent and nonpersistent gases thus reducing their effectiveness.

3. Still air conditions are important in the effect of nonpersistent gas attack, in winds in excess of 15 m.p.h. they disperse rapidly. Nonpersistent gases also are impaired in effectiveness at times of meteorological conditions of lapse or excessive turbulence.

4. The most significant air movements are caused by wind, but the direct effect of strong sunlight is to create lapse or strong up-drafts which tend to carry away the gas cloud. Clouds and foliage which prevent sunlight from reaching the earth are significant in reducing the lapse effect of sunlight on nonpersistent gases. However, within the surprise area of a 1000 lb. nonpersistent gas bomb (50 to 100 yds. in diameter), or of a 500 lb. nonpersistent gas bomb (25 to 50 yds. in diameter), a local condition of inversion is set up which tends to give a heavy immediate concentration in that area. The lower violatility of persistent gas reduces the effect of wind and lapse. The order of importance of weather factors is: (1) for persistent gases - Temperature, Rainfall, Cloud and Fog, and Wind; (2) for nonpersistent gases - Wind, Rainfall and Cloud and Fog.

5. In the following paragraphs is a general discussion of weather conditions in these areas.

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GENERAL - II GENERAL CLIMATIC DESCRIPTION

Tokyo, Nagoya, and Osaka in southeastern Honshu are located to the southeast of the central mountain system, which is a significant climatic barrier extending throughout the length of Honshu. The mountains are highest to the west and northwest of Tokyo. Osaka is located in the eastern part of the Inland Sea region with mountains both to the north and south, but they are not as high and, therefore, provide less shelter than those to the northwest of Tokyo. Yawata, located in the extreme northern part of Kyushu near Shimonoseki Strait, is directly exposed to the northwesterly monsoon winds.

The monsoons and cyclonic depressions are climatic controls of major proportions in this area, although the sheltering effect of the Japanese mountains is not to be underestimated. Winter weather is controlled largely by cold, dry, northwesterly monsoon winds, which flow outward from the intense high that prevails over central Asia during the colder months of the year. These winds absorb considerable moisture and heat on passing over the Japan Sea, and often bring orographic precipitation to the northwestward slopes of the mountains. However, they descend the southeastward slope as relatively dry foehn winds, especially in the Tokyo and Nagoya areas.

Winter extends from November through March, and relatively five weather prevails for long periods in southeastern Honshu during this season.

During the spring transitional season the Siberian high weakens, the Pacific high begins to strengthen, and the line of discontinuity between polar and tropical air masses shifts toward the northwest. In this season, cyclonic depressions tend to dominate the weather, bringing frequent day to day changes.

During summer, warm, moist, tropical air from the North Pacific high, the southeasterly monsoon, dominates the weather of this area. The mean air flow is from a southeasterly direction, but the winds in local areas vary greatly regarding both their direction and velocity. The maximum amount of rainfall, cloudiness, and humidity occurs in summer in southeastern Japan, and June and early July, the "Bai-U" period, are normally very humid, cloudy, and rainy. A secondary cloud and precipitation maximum usually occurs in September, but in late July and August the amount of cloudiness and rainfall is considerably less than in early summer. Typhoons, accompanied by high winds and heavy precipitation, are most likely to occur in late summer and early autumn.

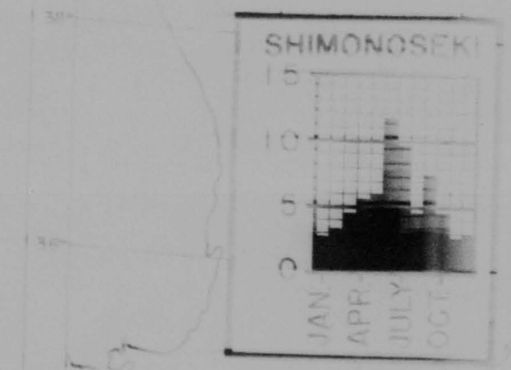
The autumn transitional season is characterized by occasional outbursts of the northwesterly monsoon, the first of which usually occurs near the beginning of September. They tend to become more frequent through October, and by November the northwesterly monsoon is normally well established. Cyclonic depressions are common, although usually not as frequent as they are in spring. In September and October occasional typhoons, also, may be expected.

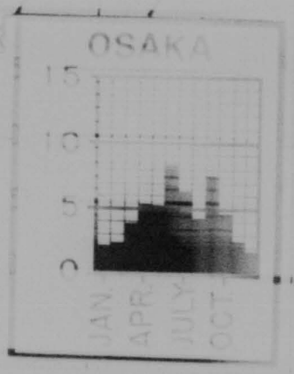
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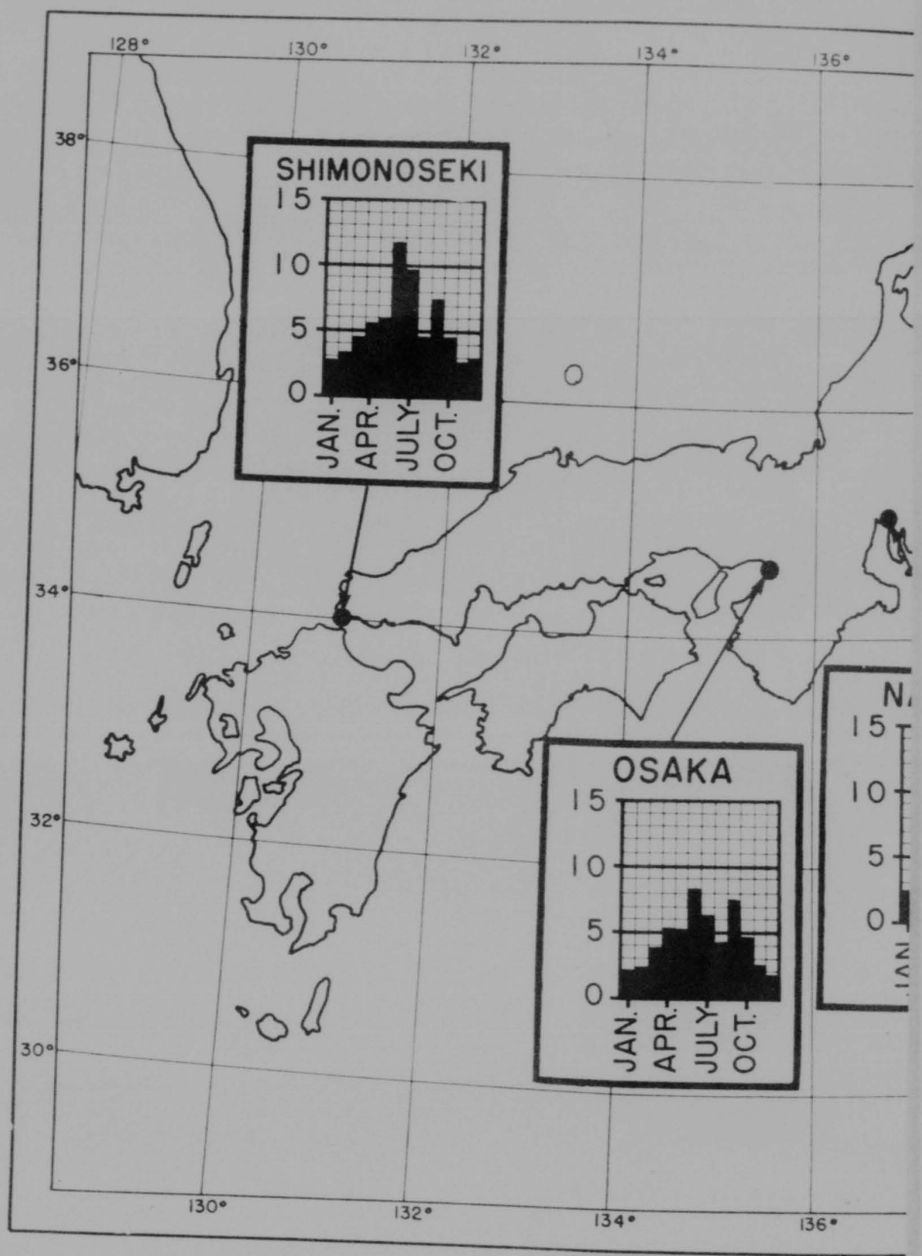
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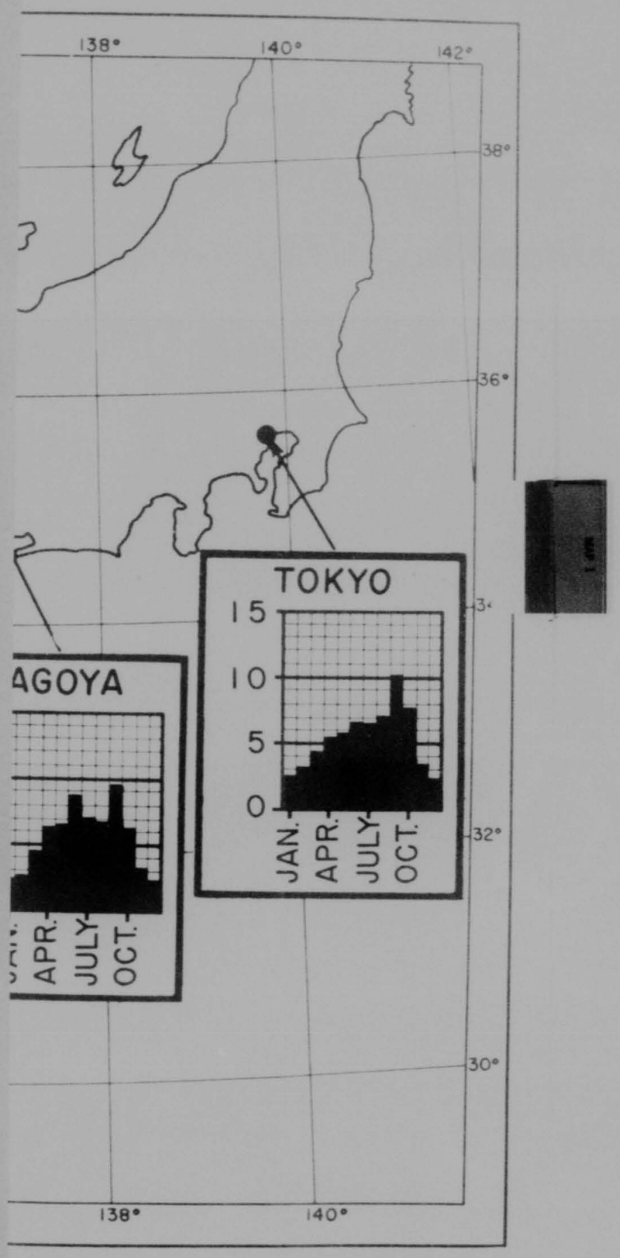


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GENERAL - III

TOKYO

Northwesterly winds prevail at Tokyo during the colder months from October through March. They are dry winds which descend the mountain ranges of the central plateau region. Southerly winds prevail during May through August, but in April and September the winds are highly variable.

Table 1. --Percentage Frequency of Winds from Each Direction and Mean Velocity (m.p.h.) for All Directions at Tokyo. (35-year record).

	N	NE	E	SE	S	SW	W	NW	Calm	Mean Vel.
Jan	30	6	2	5	4	3	6	43	1	6.0
Feb	31	6	4	7	5	3	4	40	0	6.7
Mar	29	9	5	10	10	3	3	30	1	6.9
Apr	22	11	8	15	19	4	3	18	0	6.7
May	17	10	7	16	26	6	4	13	1	6.5
Jun	13	11	9	20	28	6	3	9	1	5.8
Jul	10	11	9	20	32	8	3	6	1	5.8
Aug	13	11	9	18	30	8	3	7	1	5.8
Sep	25	13	9	11	18	4	2	17	1	5.8
Oct	32	10	6	8	6	2	3	32	1	5.4
Nov	30	7	4	7	5	2	4	40	1	5.4
Dec	28	5	2	5	4	4	6	45	1	5.6

A sea breeze is typical during the warmer part of the day in summer. Mean wind velocities are lowest at night and highest during the warmest part of the day in both winter and summer.

Table 2. --Mean Bihourly Wind Velocity (m.p.h.) at Tokyo in January and July (1909-1918)

	0200	0400	0600	0800	1000	1200	1400	1600	1800	2000	2200	2400
Jan	5.5	5.5	5.2	5.3	6.3	7.1	7.1	6.7	5.5	5.6	5.4	5.7
Jul	3.8	3.6	3.5	4.5	5.5	7.2	8.2	8.2	7.1	5.6	4.9	4.3

Relative humidity is generally high in summer and low in winter. The dampness of the air in summer is a marked feature of the climate of the Tokyo area.

Table 3. -- Mean Bihourly Relative Humidity (percent) at Tokyo in January and July (1909-1918)

	0200	0400	0600	0800	1000	1200	1400	1600	1800	2000	2200	2400
Jan	71	72	73	67	54	50	50	54	64	67	69	70
Jul	93	94	92	82	74	70	69	71	78	85	88	91

The amount of rainfall at Tokyo is less than in other more exposed areas, as the high mountain ranges to the northwest shelter the Tokyo area to a marked extent, especially in winter when northwesterly winds are predominant. The amount is much greater in summer than in winter, the principal maximum occurring in September and a secondary maximum in June. The minimum occurs in December.

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Table 4.--Mean Monthly Amount of and Number of Days with Precipitation.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr.
Amt. (in)	2.3	3.0	4.3	5.3	6.0	6.8	5.6	7.1	10.1	7.9	3.5	2.2	64.1
No. days with 0.01 in.	8	8	13	14	14	16	14	13	17	14	10	6	147

The frequency of precipitation, also, is much greater in summer than in winter, the maximum occurring in September and the minimum in December. Snowfall occurs normally on 14 days during the winter season, but it rarely remains on the ground for any appreciable length of time.

The amount of cloudiness is much greater in summer than in winter; December has a mean of 11 clear and 6 cloudy days, whereas each summer month has only 1-2 clear and 13-20 cloudy days. The scarcity of sunshine in June and July is due to the "Bai-U" or "plum rains," and that in September is due partly to the frequency of typhoons.

Winter is comparatively cold because of the northwesterly monsoon, and summer is hot--increasingly so from the coast toward the interior. The sea breeze tempers the climate in the coastal area.

Table 5.---Mean Maximum and Mean Minimum Temperature (°F.) at Tokyo (30-year record)

Mean Max.	47	48	53	63	70	76	83	86	79	69	60	52
Mean Min.	29	30	36	46	54	62	69	71	66	53	42	33

The diurnal temperature range is somewhat greater in winter than in summer. In January, the coldest month, the temperature normally rises to a daily maximum of 47° F. and lowers to a daily minimum of 29° F. In August, the hottest month, the mean daily maximum is 86° F. and the mean daily minimum is 71° F.

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NAGOYA

GENERAL - IV

At Nagoya, the prevailing winds of winter are northwesterly, and the prevailing winds of summer southerly although variable between southwesterly and southeasterly. In spring and autumn, the winds are even more variable, than they are in summer. Land and sea breezes are characteristic during the warmer months.

Table 6.--Mean Bihourly Wind Velocity (m.p.h.) at Nagoya in January and July (1909-1918)

	0200	0400	0600	0800	1000	1200	1400	1600	1800	2000	2200	2400
Jan	5.4	4.4	4.3	4.3	5.6	7.7	8.9	8.7	6.7	5.5	4.9	4.5
Jul	3.6	3.4	3.3	4.6	5.5	6.4	7.5	8.3	7.6	6.0	5.0	4.0

Very high wind velocities occur in association with typhoons in late summer and early autumn. Velocities are very high, also, following the passage of a cold front associated with a deep low, a situation that occurs rather frequently in April. Mean wind velocities are highest during the warmest part of the day and lowest at night.

The Nagoya area is very humid and oppressive, especially during the summer monsoon. The dampness in June and early July, the "Bai-U" period, and in September is so penetrating, and cloudy skies so prevalent that all objects such as books, shoes, and clothing become moldy. The relative humidity is considerably greater in summer, than in winter, as is shown in the following table. The maximum occurs in September and the minimum in March.

Table 7. --Mean Bihourly Relative Humidity (per cent) at Nagoya in September and March (1909-1918)

	0200	0400	0600	0800	1000	1200	1400	1600	1800	2000	2200	2400
Mar	80	82	83	73	60	54	52	54	63	71	75	78
Sep	91	92	93	83	72	66	64	77	84	84	88	90

The amount of rainfall is much greater in summer than in winter. A double maximum occurs--one in June and the other in September. The least rainy months are November through February, but a secondary minimum occurs in August. June and early July are very rainy and cloudy because of the "Bai-U", or "plum rains", and the maximum which occurs in September is due partly to heavy falls associated with typhoons.

Maximum frequency of precipitation occurs in September and minimum frequency in February. Precipitation occurs more frequently than the monthly average during the months of September, June, July, and April, and less frequently during each month from November through February.

Snowfall occurs normally on 16 days per year, but it usually remains on the ground for only brief periods.

June is the cloudiest month and December the least cloudy, mean percentages of sky coverage being, respectively, 75 and 47. Partly cloudy days are typical throughout the year, but they are especially frequent in winter. In summer, cloudy days are comparatively frequent, particularly in June, which normally has 17. Clear days normally range from a minimum of 2 in June to a maximum of 8 in November.

The temperature in July and August is similar to that of equatorial regions, but in January and February it normally drops slightly below freezing at night. In August, the hottest month, the mean daily maximum is 89° F., and the mean daily minimum is 73°F. Corresponding values in January, the coldest month, are 47°F. and 30°F.

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GENERAL - Y

OSAKA

Prevailing winds at Osaka are variable from month to month. However, northeasterly, northerly, and westerly winds are very frequent throughout the year, whereas southerly and southeasterly winds are very infrequent. The wind directions can be shown to best advantage in table form.

Table 8.--Percentage Frequency of Winds from each Direction and Mean Velocity (m.p.h.) from all Directions at Osaka (35-year record)

	N	NE	E	SE	S	SW	W	NW	Calm	Mean Vel.
Jan	16	21	7	2	2	9	26	14	3	7.2
Feb	21	21	6	2	2	10	21	15	2	7.2
Mar	23	27	7	2	2	10	15	12	2	6.9
Apr	19	31	9	3	3	11	15	8	1	6.5
May	16	26	8	3	3	14	18	8	4	6.3
Jun	13	25	8	2	4	16	21	7	4	6.0
Jul	11	20	8	2	4	18	26	7	4	6.3
Aug	13	25	11	3	3	14	19	8	4	6.3
Sep	19	35	12	4	3	8	10	6	3	6.0
Oct	24	38	11	3	2	5	8	7	2	5.6
Nov	20	23	11	3	2	6	13	10	2	6.0
Dec	16	22	8	3	2	7	26	14	2	7.4

Mean wind velocities are somewhat greater in winter than in summer. The maximum velocity, 58 m.p.h. from the west-southwest, occurred in September, probably in association with a typhoon.

A sea breeze is characteristic during the warmer part of the day in summer, and a land breeze is likely to occur at night.

The relative humidity at Osaka maintains a high average throughout the year, although it is neither as high in summer nor as low in winter as that of Tokyo. Northerly winds from the mountainous area to the north are relatively dry.

Table 9. --Hourly Mean Relative Humidity (percent) and Lowest Recorded (30-year record)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	71	70	70	72	73	77	77	77	74	76	75	71
Lowest	17	16	25	24	23	27	33	30	32	31	30	21

Because of the sheltering effect of mountains both to the north and south, the amount of precipitation is not as great at Osaka as it is at Tokyo or Nagoya. Summer is very much rainier than winter, although a secondary minimum occurs in August. The maximum amount of rainfall occurs in June and early July, the "Bai-U" period, and a secondary maximum occurs in September, the month of maximum typhoon occurrence.

Table 10.--Mean Monthly Amount of and Number of Days with Precipitation.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yr.
Amt. (in.)	2.0	2.3	4.0	5.2	5.2	8.2	6.4	4.2	7.5	5.0	2.7	1.9	54.5
No. days with ≥.01 in.	9	10	13	13	13	15	13	10	14	11	10	9	140

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Precipitation is most frequent in June and least frequent in December. Snowfall normally occurs on 16 days during the cold season, but it does not remain on the ground for any appreciable length of time.

The mean monthly amount of cloudiness shows a pronounced summer maximum and a winter minimum. In June, the cloudiest month, the mean sky coverage is 74 percent; in December, the fairest month, it is 48 percent.

Summer is hot and humid, but in winter the temperature normally falls to the freezing level at night. By interpolation, the temperature may be judged fairly accurately for any hour from the mean maximum and minimum values in the following table:

Table 11.--Mean Maximum and Mean Minimum Temperature (°F.) at Osaka

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Max.	48	48	55	66	73	80	86	90	83	72	62	52
Mean Min.	32	32	37	47	54	64	72	74	67	54	43	36

The highest temperature, 180° F., was recorded in August, the lowest, 19° F., in January.

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YAWATA

GENERAL - VI

Yawata, located in the extreme northern part of Kyushu near Shimonoseki Strait, is directly exposed to the northwesterly monsoon, which prevails in winter. However, the monsoon air absorbs much moisture and heat in sweeping over the comparatively warm surface of the Japan Sea, which is warmer than it would otherwise be, inasmuch as a branch of the warm Kuroshio, the Tsushima Current, flows northward through the Tsushima Strait into the Japan Sea.

During the southeasterly monsoon, June-August, the winds are generally more variable than they are in winter. Southerly winds, varying rather frequently between southeasterly and southwesterly, are generally most frequent in the area, but no specific data are available for Yawata. Variable winds may be expected during the transitional seasons because of increased frequency of cyclonic activity.

This area is very humid throughout the year because of its exposed location with regard to moist winds from nearly all directions.

The winter season is especially cloudy and rainy compared with Tokyo, Nagoya, and Osaka, which are sheltered to a considerable degree by mountain ranges during the season of the northwesterly monsoon. It may be assumed that the amount and frequency of precipitation do not vary greatly from Yawata to Shimonoseki, the nearest station for which data are available, located in the extreme southwestern part of Honshu.

Table 12.--Mean Monthly Amount of and Number of Days with Precipitation at Shimonoseki.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Amt.(in.)	2.8	3.4	4.5	5.6	6.0	11.7	9.9	4.8	7.5	4.6	2.7	3.0
No. days with 0.01 in.	17	15	15	13	12	15	14	10	14	11	13	16

The greatest contrast between this area and Tokyo, for example, is the much greater frequency of precipitation in winter, Shimonoseki having an average of 17 and Tokyo only 6 rainy days in January.

The Yawata area is considerably cloudier in winter and less cloudy in summer than Tokyo. The winter months have an average of 70 percent sky coverage and the summer months 65 percent, notwithstanding the fact that June is the cloudiest month. August, October, and November are the least cloudy months.

The temperature in the Yawata area is higher in winter and slightly lower in summer than at Tokyo, because of the warm Tsushima Current over which the northwesterly monsoon flows. In February, the coldest month, the mean daily maximum is 48° F. and the mean daily minimum is 36° F. at Shimonoseki. Corresponding values in August, the hottest month, are 86° F. and 74° F.

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APP. B

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S E C R E T

APPENDIX "B"

CHARACTERISTICS OF JAPANESE CITIES

The mountainous hinterland of the Japanese main islands has confined most large cities to the coastal fringe. As a result, most Japanese cities of over 100,000 population are located on or very near the coast, a fact of significance for gas attack because it aids identification and exposes them to daily land-sea winds.

As seen from the air, the striking aspect of large Japanese cities is the virtually solid mass of one and two story houses, with only a relatively small proportion of multi-storied modern buildings. Despite building regulations and zoning laws which have been in effect since the great earthquake and fire of 1923, the bulk of the area of most Japanese cities continues to be greatly congested with predominantly low wooden structures.

Layout of Cities

As in western cities, the hub of the Japanese city is the commercial center. Here are concentrated most of the multi-storied, modern buildings, although only in Tokyo and Yokohama are there any sizeable blocks of such structures. In many cities, particularly those having a population of 200,000-400,000, the commercial buildings are usually located along one or two main streets, adjoining masses of low, frame houses.

Surrounding the central business district are congested low-class residential sections, many of them having a population density in excess of 100,000 per square mile. Over 90% of the dwellings located here are of one or two stories. Very few large factories are located in these inner residential districts, but there are numerous small factories and household industries.

Surrounding the central congested sections of the city are less congested middle-class residential areas, mixed residential/industrial areas and purely industrial areas. The less congested residential areas taper off gradually from the congested center out to the sparsely built-up suburbs.

The purely industrial districts (usually located on the waterfront or along rivers, canals or railway lines in outlying parts of the city) are characterized by fairly modern factories. Also located along the waterfront or along rivers or canals are the dock and warehouse districts.

There are few open spaces in most Japanese cities. There are a number of parks in Tokyo but few elsewhere. Wide streets designed as fire blocks in the highly inflammable areas and a few canals are the only open areas. It is doubtful whether there are any streets in Japan outside of Tokyo and Yokohama where tall buildings front on sufficiently narrow streets to affect air currents materially. The distribution of street widths in Tokyo in 1935 is shown in the following figures:

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Percent of Total Length of Streets	Width
1.5%	88-235 feet
13.5%	23- 69 feet
85.0%	Less than 18 feet

Streets of 100 feet or more in width are spaced at relatively wide intervals -- about 1000 feet in some sections and 2500 feet or more in other sections. A study based on a large number of measurements on city plan maps of Tokyo, Osaka, Nagoya and Kobe leads to the following generalizations representing average street spacings in these four cities:

Street Width	Intervals
100 feet or more	Every 1500 feet
50-70 feet	Every 1500 feet
20-35 feet	Every 250 feet
6015 feet (alleys)	At lesser distances

Construction of Japanese Buildings

From the point of view of gas attack, the most significant feature of Japanese cities is their high percentage of one and two story buildings and congested population. One report states that the distribution in Tokyo (1937) was as follows:

One-story buildings	609,309	59.1%
Two-story buildings	412,174	40.0%
Three or more stories	9,312	0.9%

These data are believed to apply generally to other Japanese cities. There are two principal types of roofs, (1) tile roofs which comprise about 70-80% of the roofs in typical cities and (2) sheet metal roofs which comprise about 10-20%. Both types of roofs are easily penetrated by gas bombs.

The common construction of dwellings is of the column and beam type employing heavy wooden members but no load-bearing walls. Basements are not used; dwellings are raised about 18 inches off the ground on pillar supports. Permanent walls are used only on two sides (occasionally three sides); the other two sides are closed by translucent sliding paper screens (shoji) inside and sliding wooden or glazed shutters outside. These screens are generally closed at night but are kept open during the day when the weather permits. The permanent walls are usually mud plaster (adobe) over a bamboo framework with an exterior of thin wood siding or adobe.

Public buildings, schools, and office buildings are of western-type construction, adapted to withstand both fire and earthquake. They differ slightly from similar western structures in that the vertical supports are more substantial while horizontal supports (roofs and floors) are somewhat weaker. They are limited to about eight stories in height, or about 100 feet. Many are of reinforced concrete, others of brick or stone supported by steal frames. Cheaper mercantile buildings are constructed largely of wood and adobe often hidden behind a brick or plaster front.

Construction of factories varies greatly according to the type of plant and its age. The newer and larger factories are similar to those in this country. Many are modern, substantial structures, including reinforced concrete. Many medium sized factory buildings

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are constructed of wooden or steel frames covered with galvanized iron or asbestos sheeting. Due to the scarcity of steel, some of the newest munition plants are constructed largely of wood and asbestos sheeting.

Cities selected for Retaliatory Gas Attack

Ten cities in the four major industrial areas are selected in this report for possible retaliatory gas attack. The basis of selection is, (a) density of population and (b) industrial importance. With a few exceptions the congested Japanese cities are the most important industrial centers.

These four areas centering on Tokyo, Nagoya, Osaka and Yawata are certainly the most densely populated and industrially important districts in Japan. Together they contain 3/5 of the urban population and about 1/5 of the total population of the main Japanese Islands. These four areas also include 22 out of 39 priority targets, more than half of all key targets and two-fifths of all targets selected for air attack in Japanese Target Data, March 1943, prepared by AC/AS, Intelligence.

GAS ATTACK ZONES IN JAPANESE CITIES

The cities indicated as suitable for gas attack have been studied in considerable detail for the purpose of preparing gas zone maps. Density of population has been the principal consideration. Four zones have been considered having the following characteristics:

Zone I - Most densely populated area.

Includes the commercial center, inner congested residential area, and some mixed residential and industrial areas where small factories are closely interspersed with workers' homes. As an average for a number of cities Zone I, (a) has a population density of 91,000 persons per square mile, (b) contains 25% of the total city population, and (c) covers an average of 0.27 square miles per 100,000 of total city population. Workers in large plants will be found here when not at work, and the workers in the smaller factories located in the area will be found here at all times.

Zone II - Less densely populated area.

Includes less congested residential areas (but very thickly populated according to U.S. and European standards). Most areas contain port facilities and warehouses, freight yards, etc., mixed residential and industrial areas and some purely industrial areas. Again a large number of workers in the large plants will be found in their homes during the hours they are not at work and a great number of workers in small factories will be found at all times. As an average for a number of cities Zone II has: (a) a population of 54,000 persons per square mile, (b) contains 46% of the total city population, and (c) covers an area of 0.85 square miles per 100,000 of total city population.

Zone III - Large Factory Zone

Includes the principal areas occupied by large factories, often on reclaimed land on the waterfront. Few persons live in this zone but large numbers of workmen will be found here during working hours; much fewer during times when the factories are not working. Since detailed information concerning the number of employees working in the larger factories and the number of shifts, etc. is not available, it is impossible to estimate accurately the number of persons to be found in this zone at any given time.

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1. TOKYO

Population - 6,778,804 (1940).

Location - NW head of Tokyo Bay, Latitude 35° 40' N., Longitude 139° 45' E.

Importance - Tokyo's industrial importance has often been exaggerated by estimates which included the industrial output of its satellite cities (see Kawasaki and Yokohama). Even when this adjustment is made, however, Tokyo ranks as Japan's leading manufacturing city, although it is not the major center of heavy industry (See Osaka, Kobe and Yawata). Its most important industries are:

(1) Machines and machine tools (heavy machinery, all types of machine tools and electrical equipment),

(2) Aircraft (engines and instruments),

(3) Arms-Munitions (ordnance, aircraft cannon, tanks and gun powder) and

(4) Communications Equipment (radio and radio detection equipment, telephone and telegraph equipment).

Among the other important industries are iron and steel, automobiles and motors, chemicals, oil refineries and shipbuilding. In addition, there are thousands of miscellaneous small plants whose total output (machines, tools, components of all kinds and food processing) is of considerable significance. An indication of the number of such small plants scattered throughout the city is given by 1938 statistics stating that there were 15,419 industrial plants in the city (employing 5 or more persons).

Tokyo is also the administrative (civil and military) and financial center of the Empire, the political and economic nerve center of Japan's war effort. The great combines which dominate Japanese industry have their headquarters here. These factors combine to give Tokyo a great psychological hold on the Japanese masses. Effective dislocation of these control points would have wide ramifications throughout the Empire.

This is also Japan's most vital railway center, the focal point of all the Honshu main lines. Although several alternate connecting lines are available, disruption of rail traffic here would be felt throughout Japan. Even more important would be the effect on the city's own industries, since Tokyo is located far from sources of essential raw materials. With the heavy pressure being exerted on her shipping Japan has become increasingly dependent on rail transportation.

General Description. - Tokyo constitutes the northernmost extension of a mass of urban development which starts in Yokohama and continues northward virtually unbroken for about 25 miles along the shore of Tokyo Bay. The city lies at the edge of a large plain; there are no appreciable hills within 10-15 miles on all sides. Most of the city lies at sea level, with a few points rising to about 120 feet.

The city is not laid out in the typical Japanese pattern. It is a large, sprawling metropolis (approximately 360 square miles in all), with a densely congested core (some 30 square miles) and large, scattered settlements branching off NW, west and SW. More than any other large Japanese city, it is extensively cut up by parks and wide avenues, as well as rivers and canals. Most conspicuous among the open spaces in the city

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1. TOKYO (Cont'd)

are the centrally located Imperial Palace Grounds. To the east the winding Sumida River flows through the most densely built-up part of the city. The Ara Waterway, a smoothly curving river, flows along the eastern and northern limits of the congested areas.

There is a fairly distinct zoning pattern. The administrative and commercial district lies between the Palace Grounds and the Sumida River, extending northward to Ueno Park, the largest park in northern Tokyo. Just east of the Palace Grounds are the Tokyo RR Station and the famous Marunouchi district where the offices of Japan's leading commercial and industrial concerns are located. Army and Navy headquarters, the Imperial Diet and other public buildings are located just south of the Palace Grounds. The public buildings immediately east and south of the Palace Grounds are modern western-type structures. The area is cut-up by very wide, landscaped streets. Just east of the Palace moat which separates this area from the rest of Tokyo is the city's leading mercantile district. The southern part, known as the Ginza district is the site of Tokyo's largest stores and shops. Extending northward to Ueno Park in a solid mass are large stores, shops and business offices, and congested dwellings.

The largest industrial area lies between the Sumida and Ara Rivers on the eastern side of the city, and bends westward along the southern bank of the Ara River in northern Tokyo. This industrial zone has three types of factory concentrations; to the south are lumber mills and storages and food processing plants; in the center, along the Sobu Railway Line, is a miscellaneous concentration of medium sized steel mills, oil refineries, machinery, chemical and textile plants; the great Koishikawa Arsenal area covers the northwestern part of this zone. In addition to these plants, hundreds of smaller factories of all kinds extend throughout this zone. A second industrial zone extends along the waterfront in the southernmost part of the city, the site of aircraft, steel, machinery and communications equipment plants.

The most congested residential area lies to the east of Ueno Park. Dense clusters of workers' homes extend NE and SE from this area into the industrial zone. Other predominantly residential areas are located north, west and south of the Palace Grounds, in scattered settlements separated by parks, school grounds, etc. To the SW of the Palace Grounds is an open area of official residences, foreign embassies and schools.

The distribution of population is uneven and congestion varies considerably. According to the calculations made in this study, Tokyo's population density ranks second only to that of Kobe, among the large cities. Zone I has a density of 103,000 persons per square mile, while Zone II has a density of 55,000. The average density of Zones I and II combined is about 65,000 persons per square mile. Twenty-two percent of the total population lives east of Ueno Park, in an area of 15 square miles - less than 5% of the total city area.

Of the 1,029,695 buildings listed in the city in 1937,

609,309 were single-story, wood and adobe structures
412,174 were two-story structures, mainly of wood and adobe
9,312 were three or more stories, of varying construction.

As noted above, present-day Tokyo is more cut-up by parks and wide avenues than any other large Japanese city. Scattered throughout the city are three large and about 51 small parks. There are several cross-town avenues over 100 feet wide and many streets over 75 feet wide. The districts cut out by these wide streets, however, are broken only by alley-width streets. This is borne out by 1935 statistics, largely applicable today. Of the total of 7,800,000 kms. of streets in the city at that time, 1.5% were between 88 and 235 feet wide. About 13.5% were between

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1. TOKYO (Cont'd)

23 and 69 feet wide and the remainder, or 85%, were between 8.8 and 18 feet wide.

Gas Areas - Two general population zones are indicated. As a result of the uneven distribution of congested areas noted above, a proportionately greater part of Tokyo has been designated as Zone II than has been necessary for other cities.

Zone I - Zone I covers the congested central core of the city, situated along both sides of the middle Sumida River. Within this zone population density ranges from 50,000 to over 135,000 persons per square mile, while roof coverage (amount of total area covered by buildings) averages over 65%.

This zone covers residential, commercial and industrial concentrations. The commercial district is located to the west of the Sumida River, an area of large stores and shops with warehouses and residences along the river. The residential portion of this zone, the most dense in Tokyo, extends east from Ueno Park along both sides of the River. Small homes crowd one another in small blocks, cut out by medium width streets. The southeastern corner of the zone covers an industrial and warehouse area, to the south of the Sobu Railroad line. An oil refinery, food processing plants, lumber storages and miscellaneous small factories cover this area. The banks of the canals and of the Sumida River are lined with flimsy warehouses and cheap homes.

Zone II - Zone II extends in an almost complete circle about the Palace Grounds and Zone I, and projects southward along the bay. Congestion varies considerably, reaching a peak to the south of the Palace Grounds, where population density averages over 80,000 per square mile. It is a mixed area, primarily industrial along the eastern half and residential along the western half.

Zone III - Zone III covers the SE part of the city at the mouth of the Tama River. Here are concentrated aircraft parts, electrical machinery, steel, ordnance and many other types of factories.

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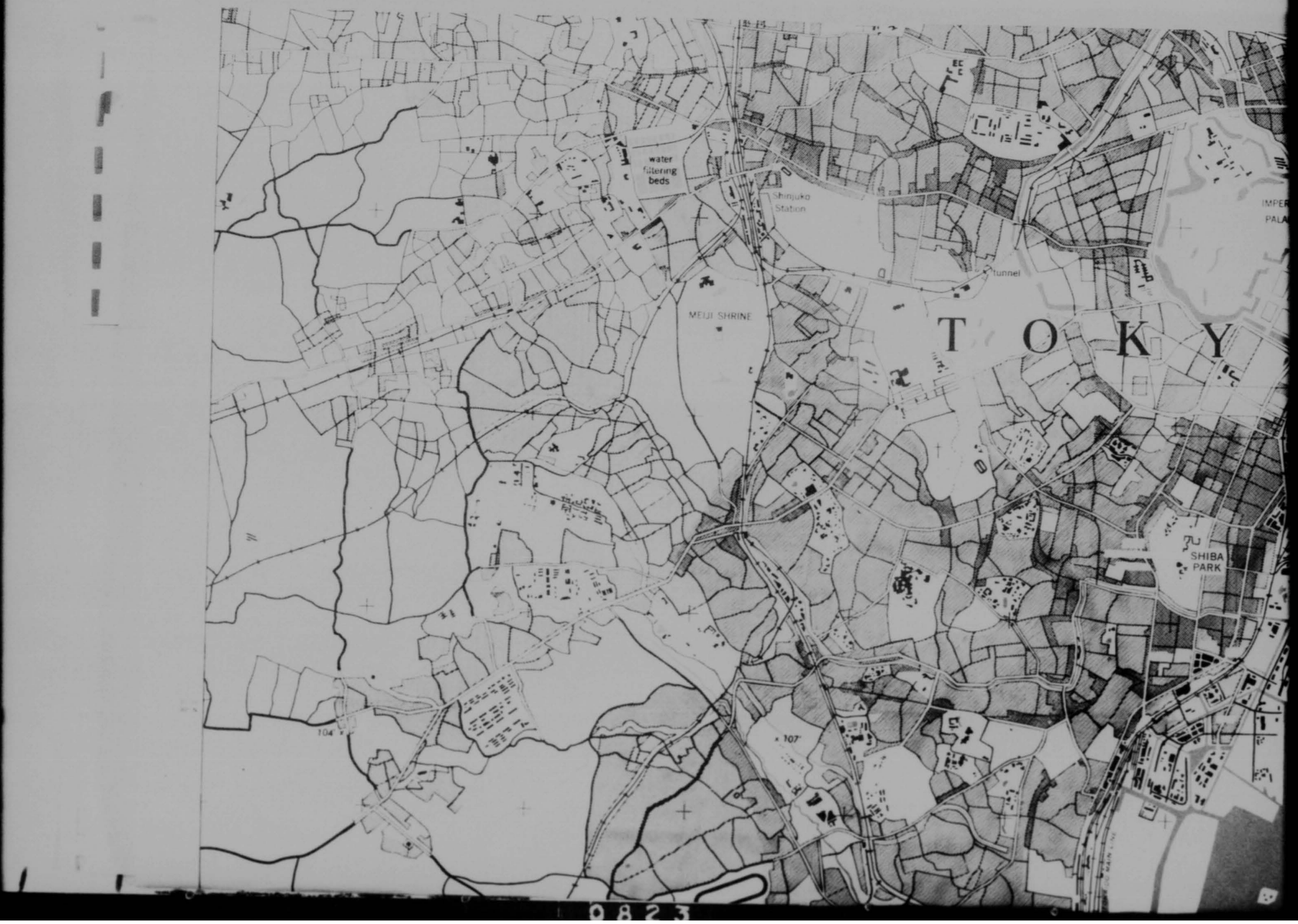


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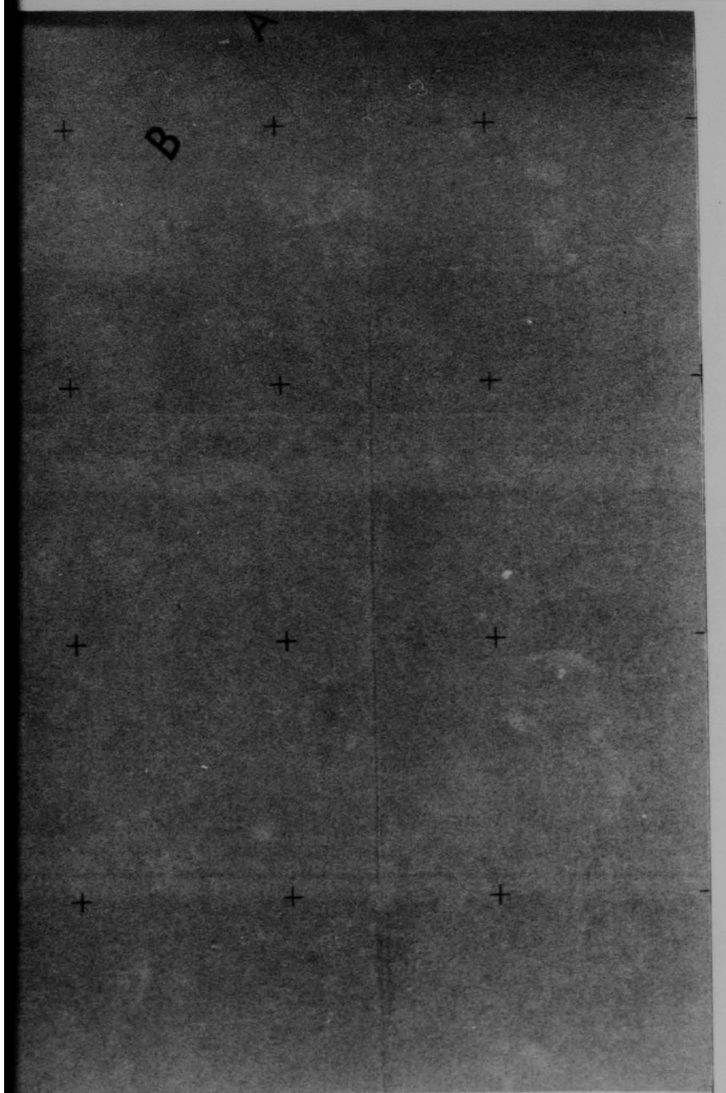
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TOKYO, JAPAN
GAS ATTACK ZONE MAP

ZONE I
ZONE II
ZONE III

STATUTE MILES

SCALE 1:35,000

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KEY AND PRIORITY TARGETS IN THE AREA

1. TOKYO

AIRCRAFT

AAF Target No.	Target Name	Significance
*357	Nakajima Aircraft, (Mushashino Plant)	With #356, estimated 15% engine production.
*356	Nakajima Aircraft, (Ogikubo Plant)	With #357, estimated 15% engine production.
539	Nakajima Aircraft, (Tanashi Foundry)	Key foundry for area aircraft industry.
799	Mitsubishi Aircraft, (Oimachi Plant)	Important production engines, parts, instruments.
331	Tokyo Gas & Electric Engineering	Important production planes, engines, parts.
	AUTOMOBILES AND MOTORS	
573	Miyata Engineering Works	Motorcycles, aircraft parts, landing barge motors.
1341	Rikuo Engine Company	Motorcycles
883	Ikegai Motor Plant	Internal combustion engines
1340	Harley-Davidson Motorcycle Company	Large, builds motorcycles, sidecars
	COMMUNICATIONS	
1481	Marunouchi Telephone Exchange	Principal Tokyo exchange, jc all domestic & cable telegraph.
326	Factory #2 of Nippon Electric Co.	With #497 largest communications equipment mfr.
888	Oki Electric Company, Ltd Pl #1	Large electrical & communications equipment firm.
826	Fujikura Electric Cable Works	Large & important production communications equipment.
	ELECTRIC POWER	
230	Senju Steam Power Station	One of area's 5 largest - 77,000 Kw.
213	Kinugawa Steam Power Station	Reserve plant for Tokyo tramways 35,000 Kw.
228	Government Steam Power Station	Important, supplies railways - 25,000 Kw.

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1. TOKYO

1345	Tokyo Municipality Steam Plant	Supplementary for tramways - 30,000 Kw.

MACHINES AND MACHINE TOOLS

916	Hitachi Engineering, Kameido Plant	Important prod heavy industry goods, conversion to war goods.
1357	Tokyo Special Machine Mfg Co, Japan Physico-Chemical Co	Army and Navy precision tools.
882	Ikegai Machine Foundry	Industrial machines, machine tools.
1361	Kokusan Machinery Co.	One of most important producers machine tools.

*Priority Targets. See Japanese Target Data, Issued March, 1943

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2. OSAKA

Population - 3,252,340 (1940).

Location - At NE head of Osaka Bay, Latitude 34° 41' N., Longitude 135° 45' E.

Importance - Recent prewar statistics indicated that Osaka ranked second only to Tokyo as a manufacturing center. In peacetime, it was also Japan's leading trade and commercial city. Among the most important war industries now located here are: ordnance arsenals, machines and machine tools, steel and other metal alloys, chemicals, shipbuilding, textiles and food processing. In addition to the larger industrial plants, there are several thousand small factories, the total production of which is significant. In 1938, for example 15,677 factories (employing 5 or more persons) were listed in the city. Located in neighboring towns (such as Akashi, Nishinomiya, Sakai and Wakayama) are aircraft, metal and chemical plants which depend on Osaka for components and for some of their workers.

Osaka is also one of Japan's vital transportation centers. Located at the heart of Japan's main island, it is a center of land and sea traffic, and an important terminal for military supplies. Not only is Osaka an important station on the Tokaido Line, but it is also the terminus of an alternate line to Nagoya (Kansai Line) and of a line to Tsuruga, main military port on the Japan Sea. Numerous electric lines connect it with the neighboring towns.

Osaka is the capital of Osaka Prefecture, and the seat of its civil and military administration.

General Description - Osaka stands on level delta land formed by the Yodo River and its numerous tributaries. Many canals criss-cross the city, especially in the central part where they form regular rectangular patterns, giving rise to its name as the "Venice of the Orient." Conspicuous landmarks, in addition to the rivers, canals and waterfront, are Nakanoshima, a long island in the Aji River (site of many government buildings), Osaka Castle just to the SE and the modern commercial district in the heart of the city.

There is a distinct pattern of land use. The predominantly residential districts are located in three parts of the city, the largest of which occupies the entire southeastern part. The second residential district stretches along a thin strip on the north bank of the Yodo River. The third and more open residential district is located in the northernmost part of the city. The commercial district, marked by clusters of western-type buildings, occupies the center of the city - an area intersected by many canals. The principal industries are concentrated in a semi-circular area, starting from the mouth of the Yamato River on Osaka Bay to the south, running NW along the waterfront to the Yodo River and then bending eastward along both banks of that river. Another industrial area is located to the east of Osaka Castle. This regular pattern is broken by the frequent interspersion of workers' homes among industrial and commercial buildings.

Osaka is one of Japan's most densely populated cities, ranking about third in this respect. According to the calculations made in this study, the average population density of Zone I is 81,000 persons per square mile while that of Zone II is 60,000. The overall density of Zones I and II combined is 64,000 persons per square mile.

As mentioned above, Osaka is a vital transportation corridor and its industries are absolutely dependent on the functioning of this transportation. The city's most important railroad stations and freight yards are located in

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areas where population density is high, and the main railroad lines pass through the most congested areas. The main port facilities and warehouses adjoin a congested area.

To a greater extent than in most cities the areas of greatest population density are also the sites of important industries. Most of the larger industries tend to concentrate along the upper Yodo River where population density is high. Moreover, thousands of smaller factories are scattered along the periphery of the main industrial belt, in the midst of the most congested parts of the city.

Gas Areas - As indicated on the accompanying map, there are eight gas areas in Osaka.

Zone I - Zone I covers a congested residential/industrial area in the fork of the Yodo River, the commercial district in the heart of the city, and an important industrial district near the waterfront. The central portion of this zone covers not only the commercial district (with its heavy concentration of business offices, retail and wholesale establishments, etc.) but also the local and prefectural government offices.

The southern and western parts of this zone cover a mixed residential/industrial/commercial area, where population density is the highest in the city. Located in this part of the zone are such important industries as copper, aluminum and steel alloy plants, machine and tool plants, automobile and aircraft parts factories and chemical plants. The northeastern tip of this zone covers a mixed residential/industrial area, the site of one of Japan's largest copper refineries and fabricating plants, as well as several machinery and small arms plants and textile mills. The Osaka Station, Osaka's main passenger station is also located in this district.

In addition to the individually important plants mentioned, there are scattered along the SW and N parts of this area hundreds of small factories, an electric car barn, the city's gas works, central post and telegraph offices and the hugh Osaka central food market.

Zone II - Four areas comprise Zone II.

A part of Zone II extends along the north bank of the Yodo River. This is primarily a residential area, with dense clusters of workers' homes near the river and an industrial belt to the north. Principal industries found here are textiles, steel and aluminum fabricating plants and several machinery plants. An important connecting spur of the Tokaido RR line passes through the most congested part of this area.

A second part of Zone II stretches along the south bank of the Yodo River. This is primarily an industrial area. Several large industries are located here, among which are locomotives works (at least partially converted to heavy ordnance), machine and tool plants, several heavy chemical and dyestuff plants, aluminum and other metal alloy plants, and a shipyard.

Within the western area of Zone II is the crowded district immediately east of the Osaka piers, an area of workers' homes, warehouses, wholesale establishments and industrial plants. Along the waterfront is the important port area, congested with warehouses. Among the most important industries in this area are a steel plant, machines and tools, oil refineries and storages, shipyards, automotive (partially converted to munitions), chemicals and a power plant. Several freight yards, important for trans-shipment of land-sea cargo, are also located in this area.

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2. OSAKA

The fourth and largest part of Zone II extends along the eastern side of the city, from the Yodo River to the north to the more open residential district in the SE. This is a mixed residential/commercial/industrial area. The most congested part of this area is to be found just south of the Castle. Several large commercial buildings dot this district. The southern part of the area is predominantly residential becoming more open to the SE. Industries include the Osaka arsenal, one of Japan's largest automatic arms and mechanized equipment arsenals, and five or six other arms factories producing small arms and components. Military barracks and headquarters are located near the Castle. The Kansai RR line and a spur of the Tokaido line pass through the most congested part. There are about five freight and passenger stations of which the Tennoji, to the south, is the most important.

Zone III - There are three distinct areas in this zone which includes the industrial concentrations in the northern and western parts of the city fronting on Osaka Bay. In the NW around Amagasaki Harbor are important steel and machine tool plants, the second largest steam power plant in Japan (just off map to west) a very large glass plant and other industries. Further south on the bay front between the Shin Yodo and Aji Rivers are aircraft, iron, steel, electrical equipment, and ship building plants and the large IGR railroad shops. A smaller area north of the Kizu River includes a steel plate factory, a shipyard and important dry docks. Many of these plants are of similar construction to like plants in this country and Europe.

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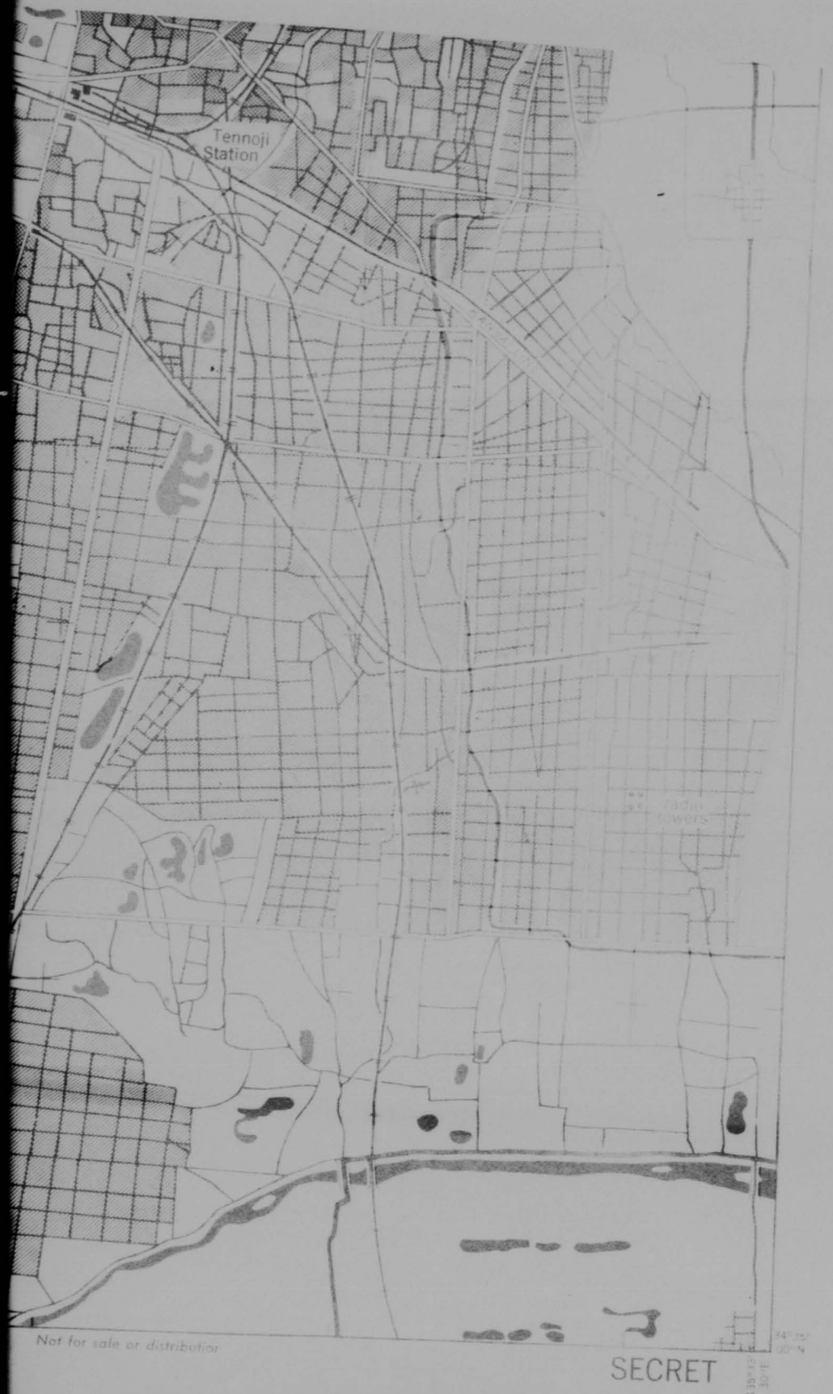


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2. OSAKA

KEY AND PRIORITY TARGETS IN THE AREA

AAF Target No.	Target Name	Significance
	ARMS, MUNITIONS	
382	Osaka Arsenal	One of most important arsenals.
	ELECTRIC POWER	
322	Kasugade No. 1 Steam Power Plant	Important - 50,000 Kw.
323	Kasugade No. 2 Steam Power Plant	Important - 65,000 Kw.
324	Fukuzaki Steam Power Plant	Important - 40,000 Kw.
325	Kizugawa Steam Power Plant	Important - 100,000 Kw.
	IRON AND STEEL	
264	Sumitomo Steel Works No. 1	Important; castings, forgings, special steel.
*713	Nakayama Steel Works	Important, blast furnace products.
	MACHINES AND MACHINE TOOLS	
687	Osaka Wakayama Iron Works	Machine tools, gauges, aeroplane engines & parts.
1191	Hatsudori Seizo	Diesel engines, locomotive parts & machinery.
	NAVAL BASES AND SHIPYARDS	
272	Osaka Iron Works Unit No. 1	Important; can build ships of 12,000-ton class.
273	Fujinagata Shipyard	Light cruisers, destroyers, submarines.
699	Osaka Iron Works Unit No. 2	Operates in conjunction #272.

*Priority Targets. See Japanese Target Data, Issued March, 1943

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3. NAGOYA

Population - 1,328,084 (1940).

Location - At the head of Ise Bay, Latitude 35° 09' N., Longitude 136° 55' E.

Importance - Nagoya ranks among the primary war production centers in Japan proper. It is one of the leading producers of aircraft, machine tools, automobile parts, railroad equipment (much of this capacity converted to tanks), high grade alloys, ordnance, textiles and ceramics. In addition, it is the site of hundreds of smaller factories producing bicycles, machinery, precision instruments, chemicals and pharmaceuticals, as well as food processing plants. In 1938 Japanese industrial directories listed 5,863 factories (employing five or more persons) in the city, many of which were small household establishments producing components for the larger plants. Moreover, Japan's largest automotive works and three or four aircraft assembly plants are located within 20 miles of the city and depend on it for parts and for some of their workers.

Nagoya is also one of Japan's vital railroad centers. Not only is it an important station on the Tokaido Main Line (Tokyo-Kobe), but it is also the terminus of the Kansai Line (Nagoya-Osaka) and of the Chuo Line (Nagoya-Tokyo). In 1936-37 Nagoya ranked first in Japan in the number of freight cars handled, third in gross volume of goods handled, and fourth in gross number of passengers. There are nine railroad stations in the city. In addition to the Imperial Government Railways, there are four privately-operated electric passenger railways which connect Nagoya with many of the surrounding towns and have their terminals in the city.

Nagoya is the capital of Aichi Prefecture and the seat of its civil and military administration. Its port ranked among Japan's five busiest in peacetime.

General Description - Nagoya city is distinctly outlined by the harbor to the south, the Shonai River along the western and northern sides, and by low hills to the east. The city is low-lying with comparatively few buildings exceeding three stories in height.

Three main canals run through the central urban area. They are narrow and their banks are lined with lumber storages, warehouses, landing stages and dwellings. Open spaces include a number of parks, several wide avenues, running generally N-S and E-W, and the "Y"-shaped railroad right-of-way.

The city's rapid growth in the past 15 years has resulted in a minimum of city planning and a mushroom growth of shops and workers' homes. The central portion of the city is especially crowded, with comparatively few wide streets. Wider streets and better spaced residences prevail along the eastern and southeastern parts of the city. The great majority of homes in the city are built in the traditional Japanese style and are rarely more than two stories high. Many of the newer factories are of asbestos or metal sheeting over steel frames or reinforced concrete and differ little from factories in this country and Europe. The older plants are of wooden construction. There is a high correlation of older industrial plants and dense workers' quarters. The newer factories are located along the NW, NE and southern extremities of the city. Several of these factories are surrounded by the homes of their employees.

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HEADQUARTERS ARMY AIR FORCES

ROUTING SLIP

TO: DATE

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ATTENTION:	ROOM

FOR:

	COORDINATION		INVESTIGATION		NEC. ACTION
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Miss Benson —
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Major Spilman may know about it
ACP
13/7/44

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3. NAGOYA

Gas Areas - Six areas are indicated.

Zone I - Zone I comprises the heart of Nagoya city. In the center of this area are dense clusters of workers' homes and small household shops adjoining the city's commercial district, including many company offices, banks, wholesale establishments, textile company showrooms and department stores. To the south and east of these business buildings are hotels, theaters, the main post and telegraph offices and numerous factories of moderate size. Factories and warehouses dot the southern part of this zone especially along the banks of the canals. Some of these are three or more stories high.

Zone II - Zone II comprises three districts. One of these districts extends along the eastern side of the city. The southern half of this district covers the workers' homes crowding important aircraft factories, alloy steel plants, arsenals, a synthetic petroleum plant and hundreds of smaller factories. More open residential areas extend eastward. The northern half of this district covers workers' homes situated among two aircraft engine factories, four large machine tool plants, several textile plants and many smaller factories. The western part of this district (next to the Castle Grounds) contains the prefectural and local government offices. The northern part (north of the Castle Grounds) includes several textile and machine tool plants, closely surrounded by some of the city's poorest dwellings.

A second district of Zone II covers the warehouse area of the port of Nagoya. Warehouse construction here varies from reinforced concrete to sheet metal or asbestos slate over steel frames. The warehouses located along the short connecting canal north of the piers are small, flimsy structures.

The third portion of Zone II covers the Nagoya Station, and includes the city's main freight yard (site of very large warehouses) railroad shops, textile factories, automobile parts and ceramics plants, and many smaller factories. Interspersed among these are workers' dwellings, most of which are inhabited by railroad employees and their families.

Zone III - Two small areas comprise Zone III. The larger, to the east of Nagoya harbor, contains aircraft, chemical and other plants, while the smaller, NW of the harbor, contains chemical, shoe and other factories.

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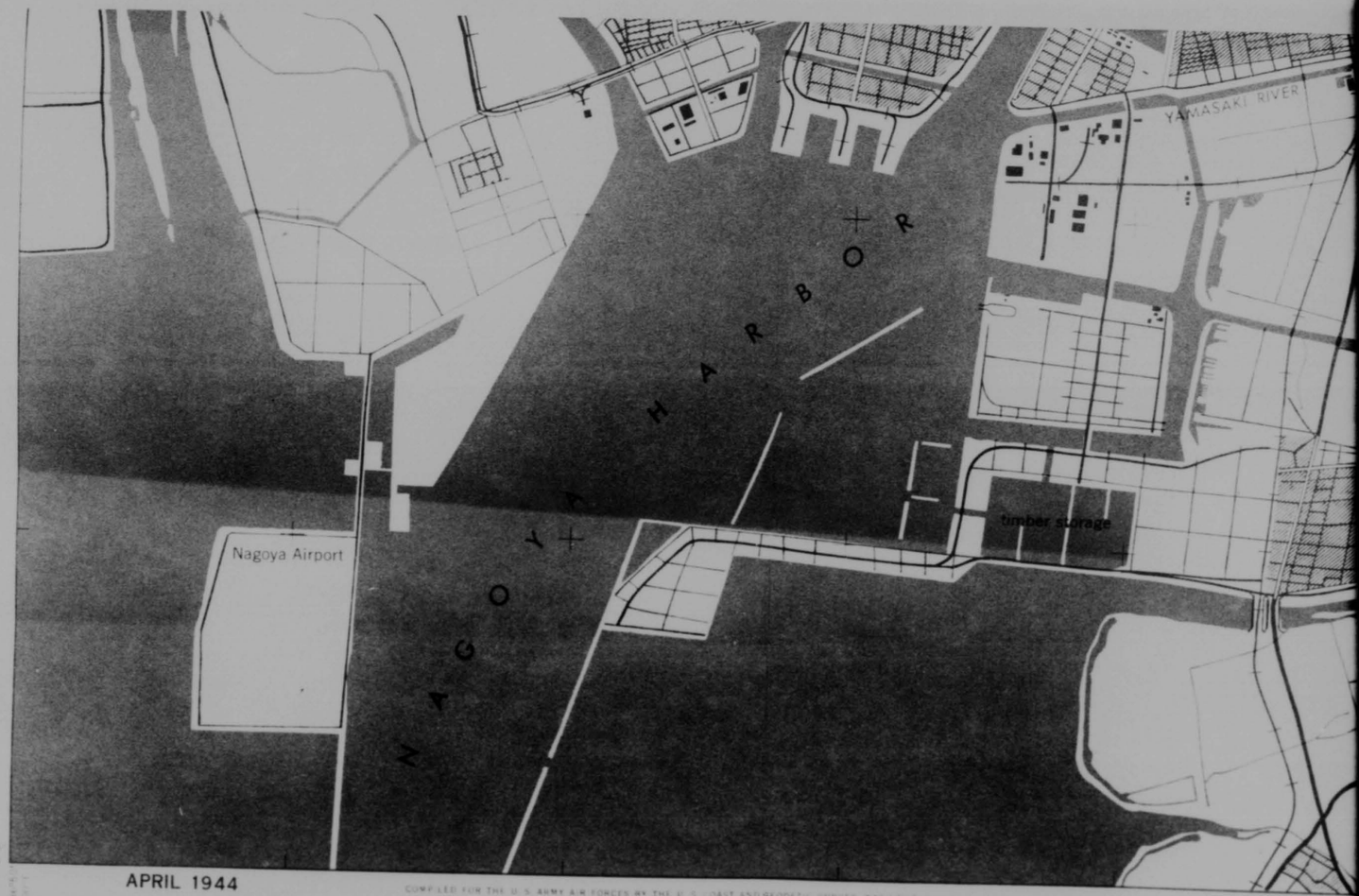


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APRIL 1944

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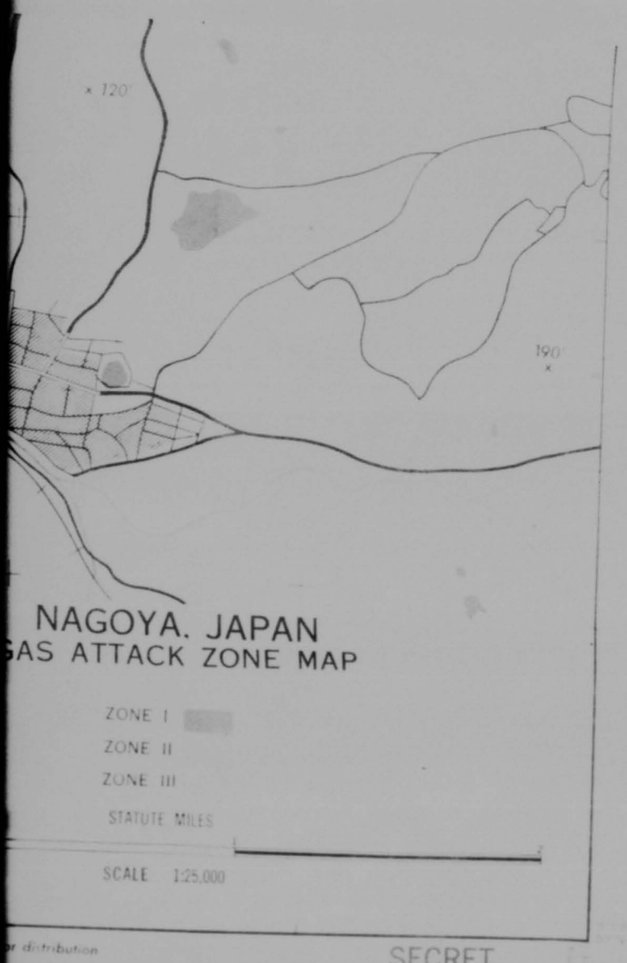
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3. NAGOYA — KEY AND PRIORITY TARGETS IN THE AREA

AAF Target No.	Target Name	Significance
	AIRCRAFT	
*193	Mitsubishi Aircraft Engine Works	One of most important engine plants.
*194	Mitsubishi Aircraft Works	Important research; also planes, engines.
197	Atsuta Factory of Nagoya Arsenal	Ordnance, also aircraft components.
198	Aichi Aircraft Works	Planes, engines, instruments.
	ARMS, MUNITIONS	
241	Nihon Vehicle Company	Important tank & munitions production.
200	Toriimatsu Factory of Nagoya Arsenal	New, large, important ordnance production.
	ELECTRIC POWER	
195	Nagoya Steam Power Plant	Main source of steam power for Nagoya - 109,000 Kw.
	IRON AND STEEL	
247 a,b,c	Daido Electric Steel Company	Munitions, tools, aircraft parts; 3 units.
	MACHINES AND MACHINE TOOLS	
254	Mitsubishi Electric Manufacturing Co.	Important tools, aircraft parts.
1146	Nagino Plant of Okuma Iron Works	Important tools & munitions production.

*Priority Targets. See Japanese Target Data, Issued March, 1943.

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4. YOKOHAMA

Population - 968,091 (1940)

Location - Western side of Tokyo Bay, Latitude 35° 27' N., Longitude 139° 38' E.

Importance - In peacetime, Yokohama was Japan's leading commercial port. In recent years, the city had also become a major industrial center, its industries constituting an extension of those in Tokyo and Kawasaki. The principal industries are oil refineries, shipyards, automotive, munitions and ordnance, chemicals and alumina. A moderate sized aircraft engine factory is reported to be located a few miles south of the city. The city's great warehouses, now partly unused due to cessation of commercial transport, are probably utilized for storing military goods of all kinds.

Yokohama is an important transportation center. The vital Yokohama-Tokyo RR line leads along the waterfront to the harbor, passing through some of the most congested parts of the city. Private electric lines parallel the main line. The city is an important military trans-shipment point.

General Description - The city proper occupies a "V"-shaped site, in a valley which opens toward the bay. Low hills and bluffs border this valley. The city has expanded rapidly in recent years and numerous settlements are now located in the valleys across the hills which flank the city proper. The city is cut-up by numerous canals and rivers, and by wide streets and multi-track railroad lines. These inclose dense clusters of houses flanked by very narrow interior streets. Yokohama was almost completely rebuilt after the earthquake and fire of 1923, and its waterfront commercial district contains a relatively large proportion of modern buildings.

Because the city is dissected into numerous built-up areas by low bluffs, its overall population density is relatively low. However, the target areas covered by Zones I and II (see below), are about as congested as those of other large cities.

The pattern of land use is fairly regular. The commercial district is concentrated in the eastern part of the city proper and extends down to the warehouse district near the main piers. Here are located virtually all the public buildings as well as large business offices. To the east and NE is a large district of warehouses, wholesale houses and large stores. To the west is the heart of the city proper, a predominantly residential area. The industrial zone stretches northward along the waterfront toward Kawasaki with a spur bending southwestward along a valley from the main Yokohama RR Station. Some of Yokohama's most congested workers' quarters stretch along the railroad line toward Kawasaki city. A region of better spaced residences stretches along a valley across the Yamate bluff on the SE side of the city proper.

Gas Areas - Three areas are indicated as suitable for gas attack.

Zone I - Zone I covers the center of the city proper, a triangular area congested with residential and mercantile structures. This is the most densely populated region in the city. Dense clusters of low residences, broken only by narrow streets, extend inward. The northern and western parts of this district are covered with cheap native shops and theaters. There are no large factories in this zone and comparatively few small household shops.

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4. YOKOHAMA

Zone II - Zone II comprises two separate areas.

The larger portion of Zone II consists of a long, narrow strip extending northward along the waterfront from the Yokohama Port area almost to the Tsurumi River. This is a mixed residential/industrial region, with cheap workers' homes along the railroad lines and most of the city's heavy industry along the waterfront. While there are many open spaces (near the railroad and factories), much of this area is densely built-up.

Workers' homes extend along the railway lines and inland to the foot of the flanking hills and into the valleys. The northernmost part is a crowded residential area with numerous small factories and stores. Located along the waterfront, within the boundary of this area, are such industries as oil refineries, automotive, chemical and machinery. Also located here are oil tank farms, large warehouses and a steam power plant. Located on the reclaimed plots of land just outside this area are oil refineries, foundries, shipyards, and chemical plants. The central part of this area, just NW of the Yokohama Station, is covered with saw mills and lumber storages interspersed among workers' homes. A cheap mercantile district extends through the middle of the area, between the Tokyo-Yokohama RR and the industrial belt along the waterfront.

The southern part of this area covers the waterfront of Greater Yokohama. This section is also divided into north and south areas. The northern part, ranks second in population density only to Zone I. Here are located the huge Takashima RR Freight Stations, the Yokohama Passenger Station which is almost always crowded. Extending westward into two valleys are workers' homes, cheap mercantile districts and a central industrial belt, the site of electrical equipment, chemical and textile plants. The western outskirts of the area cover better constructed and well-spaced residential districts. Located along the waterfront, on the border of this area, is the huge Yokohama Dockyard. The southern part of this area covers the commercial, warehouse and best mercantile districts of the city. Most conspicuous are the western-type commercial structures, housing some of the largest business offices as well as wholesale and retail houses. Just to the east are Yokohama's great warehouses and storage sheds. The entire southern part of this area is well-zoned, with wide streets and canals and only occasional congestion.

The second part of Zone II covers a residential settlement located on the southside of the Yamate bluff, south of the city proper. This is an area of congested dwellings and mercantile buildings.

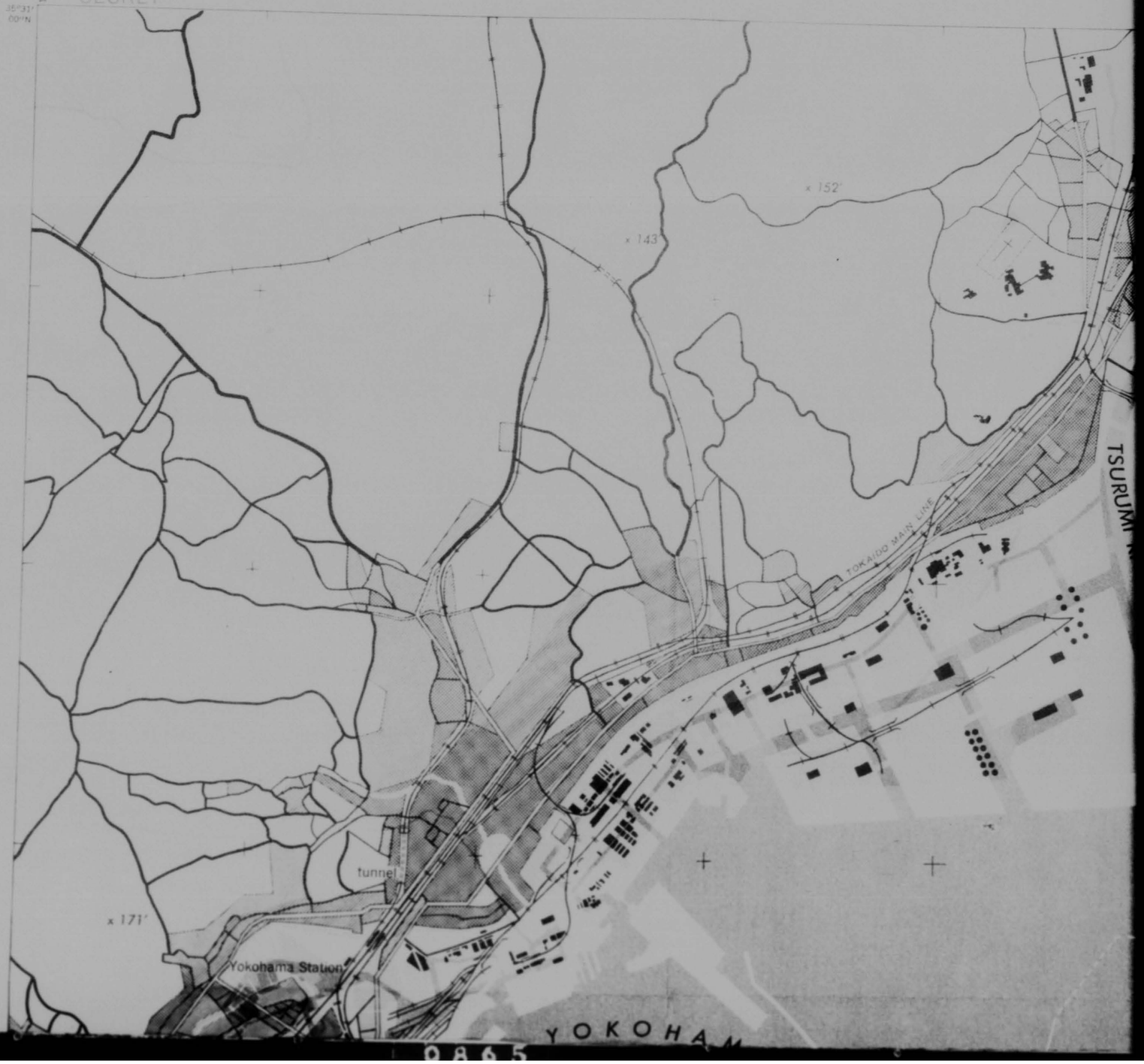
Zone III - Zone III consists of two separate areas. One is on made land at the mouth of the Tsurumi River where there are alumina automobile and chemical plants. The other is at the southern end of the city where machinery and aircraft parts are manufactured.

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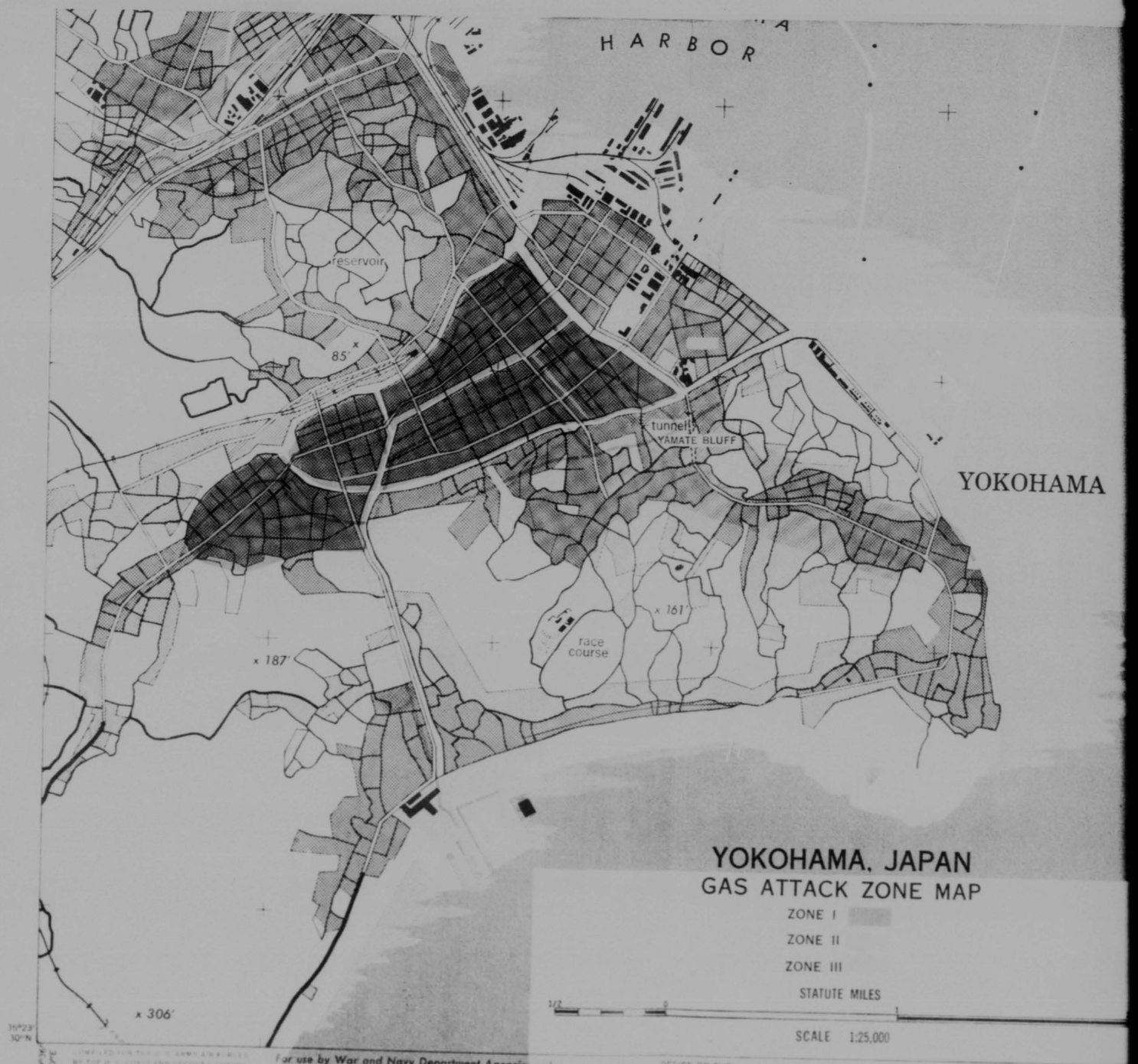
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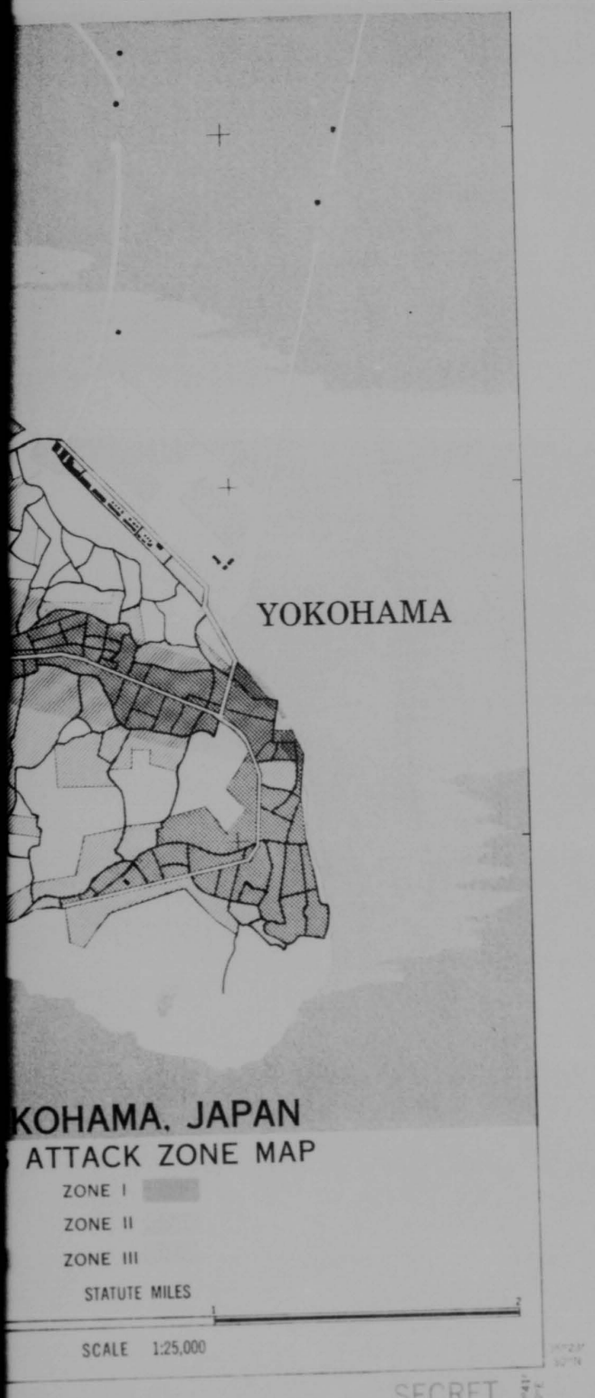
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4. YOKOHAMA

KEY AND PRIORITY TARGETS IN THE AREA

AAF Target No.	Target Name	Significance
	AUTOMOBILES AND MOTORS	
*522	Nissan Auto Company	Highly important, produces military vehicles.
72	Ford Motor Company	Light trucks, tanks, probably ordnance.
	COMMUNICATIONS	
75	Furukawa Electric Co. Plant #1	Important production telephone telegraph wire, accessories.
	ELECTRIC POWER	
63	Kanagawa Steam Power Plant	One of 5 largest in area - 21,500 Kw.
	PETROLEUM	
*87	Ogura Oil Company	Large refinery & tanks.
	SHIPYARDS	
*69	Yokohama Dockyard	One of largest in Japan.

* Priority Targets. See Japanese Target Data, Issued March, 1943

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5. KOBE

Population - 967,234 (1940)

Location - NW head of Osaka - Latitude 34° 40' N., Longitude 134° 10' E.

Importance - In peacetime, Kobe ranked as one of Japan's leading ports and shipbuilding centers (having built approximately 23% of all types of ships built in Japan in 1937-38). At present, it is also important as a producer of aircraft, steel and steel alloys, rubber tires, heavy ordnance, railway equipment, machinery and machine tools. Located near Kobe, and partially dependent on it for materials and some of their workers are aircraft, chemical and textile plants. In contrast to other large industrial cities, there are comparatively few small industries (match factories and food processing plants) scattered throughout the city.

Kobe is also an important railway center, being the terminus of the Tokaido Line (Tokyo-Kobe) and of the Sanyo Line (Kobe-Shimonoseki). There are five railroad stations and an important rolling stock factory in the city. Kobe is an important trans-shipment point for military and civil cargo.

Kobe is the capital of Hyogo Prefecture and the seat of its civil and military administration.

General Description - The city occupies a long, narrow strip of land, flanked on the south by Osaka Bay and on the north by a range of high, wooded hills. The restricted area for development has made for considerable congestion with relatively few open spaces. Three wide Avenues run E-W through the city and one N-S, just north of the central docks. Other open spaces include the Shinminato River south of the pier district, the elevated Tokaido RR Line and a few small parks.

The commercial district is located in the center of the city, just NW of the central piers and south of the elevated railway lines. The principal government and other municipal buildings are located N and W of the commercial district, in an area extending up into the foothills to the north. The predominantly residential districts are located to the west and north of the commercial district. Another residential area, this one interspersed with factories and some commercial buildings, extends along the eastern side of the city. Better spaced residences, schools and public buildings extend along foothills at the northern outskirts of the city.

Kobe is probably the most densely populated of Japan's large cities. According to the calculations made in this study, Zone I in Kobe has a population density of 104,000 persons per square mile, while Zone II has a density of 60,000. In other words, the average density of Zones I and II is about 76,000 persons per square mile.

Kobe, a city with no large rivers or canals, is dependent for water on 3 large reservoirs in the hills to the north.

Gas Areas - There are four gas areas in Kobe.

Zone I - Zone I covers the heart of Kobe city. It extends along both sides of the Tokaido Main Line and is bounded on the east by the Kobe Steel Works near the waterfront and a cemetery to the north and on the west by the Shinminato River. The center of this area is occupied by the city's densely crowded dwellings adjoining the commercial district, conspicuous by its modern

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5. KOBE (Cont'd)

western buildings. Just W and N of the commercial district are the government buildings, central post and telegraph offices and other public buildings. A solid mass of workers' homes extends W and N. This is the most densely populated part of Kobe city, with few modern structures. Among the most important industries located in the western part of Zone I are aircraft, ordnance, machinery, chemical and shipbuilding. The eastern part of Zone I is a mixed residential/commercial/industrial area. Workers' homes extend throughout this part of the zone, particularly near the elevated railway line. Located here are many native stores and food processing plants. Among the most important industries located here are rubber, steel and chemical. Small factories are scattered throughout this part of the zone. Two important steel plants are located on the waterfront, just outside this zone.

Zone II - Zone II comprises two separate areas. The easternmost area covers a residential district. There are relatively few modern buildings in this area.

The western section of Zone II extends from the conspicuous Mitsubishi Dockyard on the E to the western outskirts of the city. The northern part is predominantly residential; the southern part highly industrialized. The principal industries located here are shipyards, aircraft, rolling stock, textile mills, chemical and precision instruments. Also located here are sugar refineries, a large oil storage and an important power plant.

The principal freight and passenger stations are all located in the most congested parts of the city.

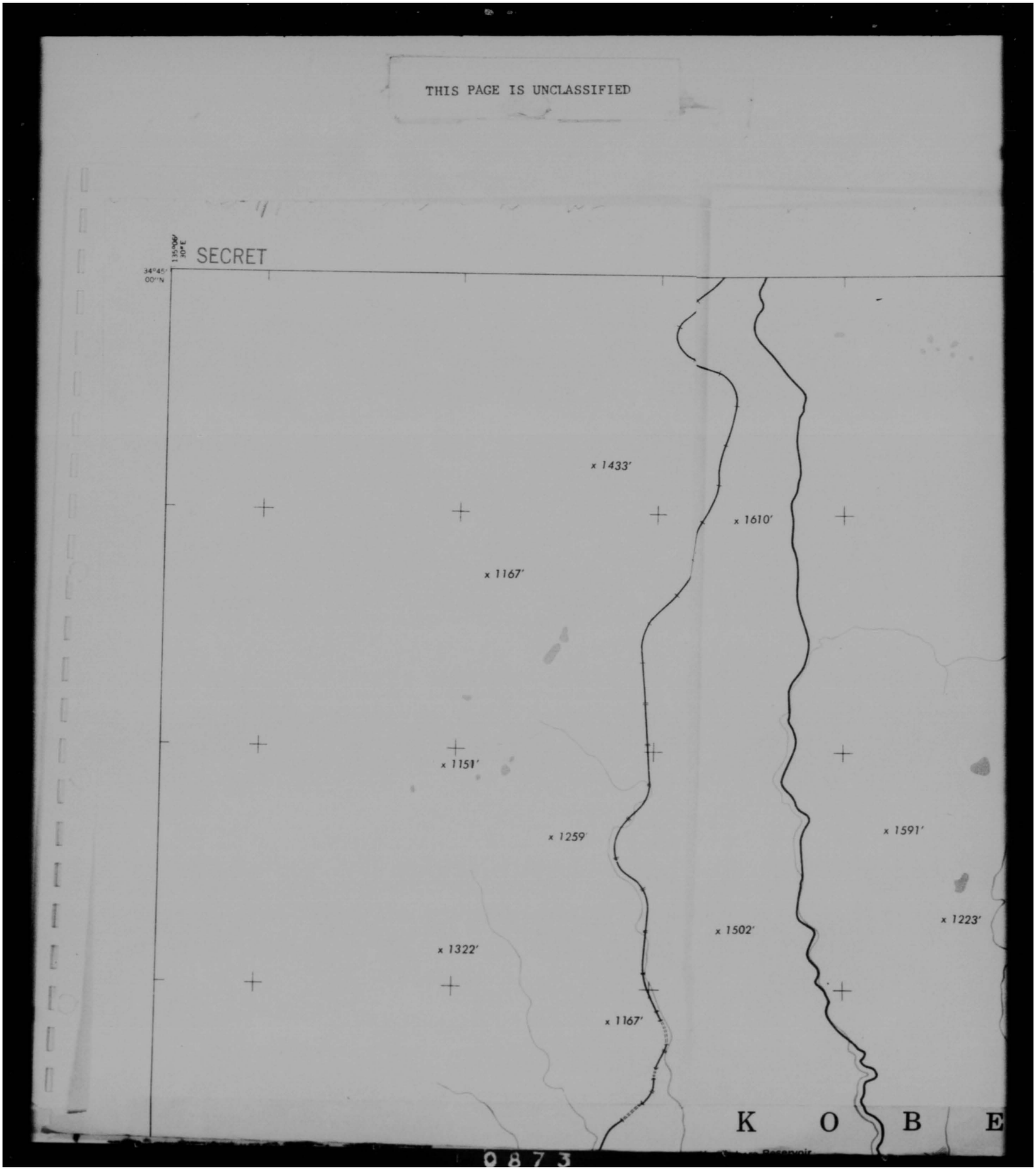
Zone III - The residential and business areas are so mixed that only a small area north of the dock section can be said to be only industrial. In this area are four steel plants, at least one of which has aluminum rolling capacity.

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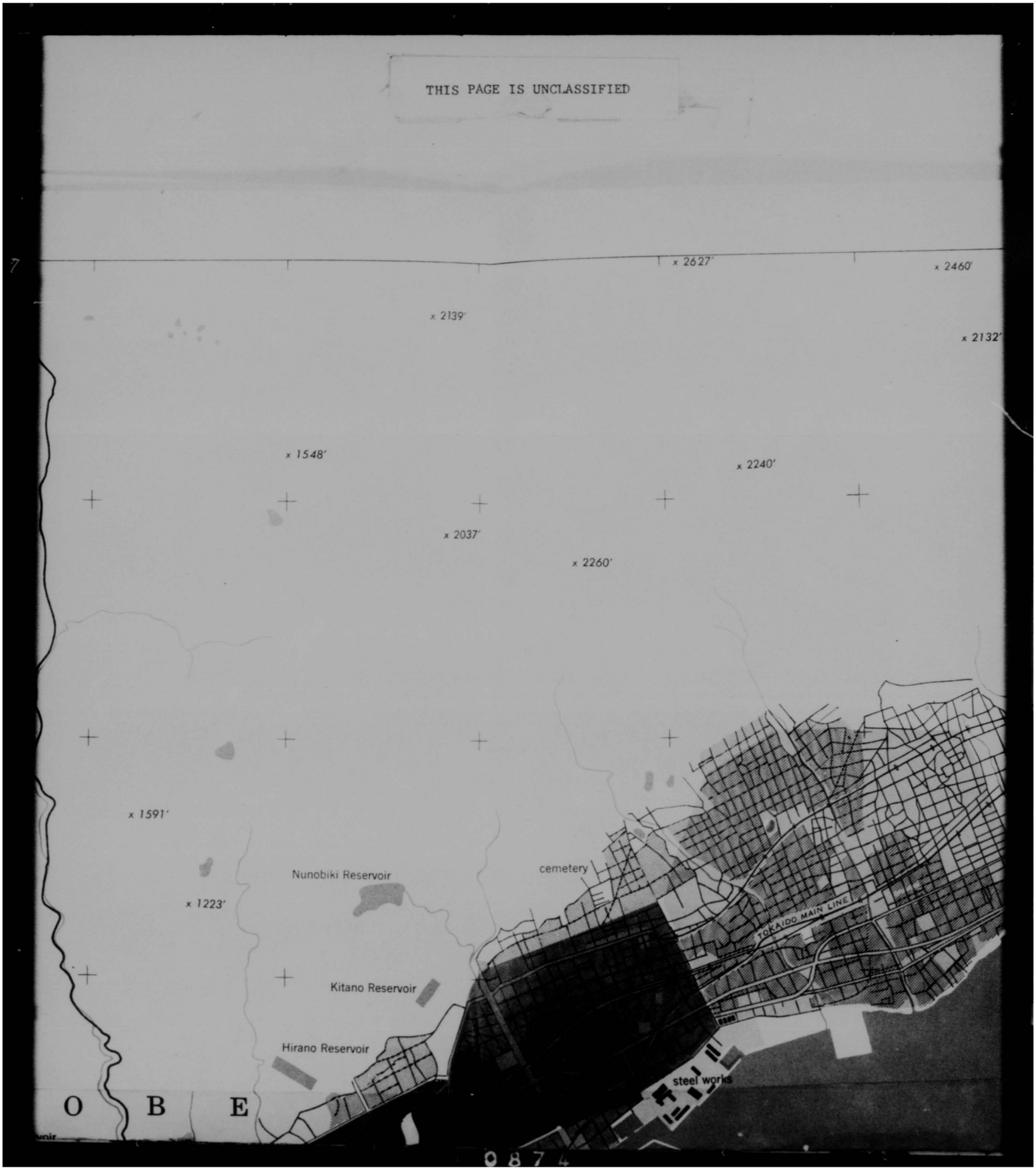
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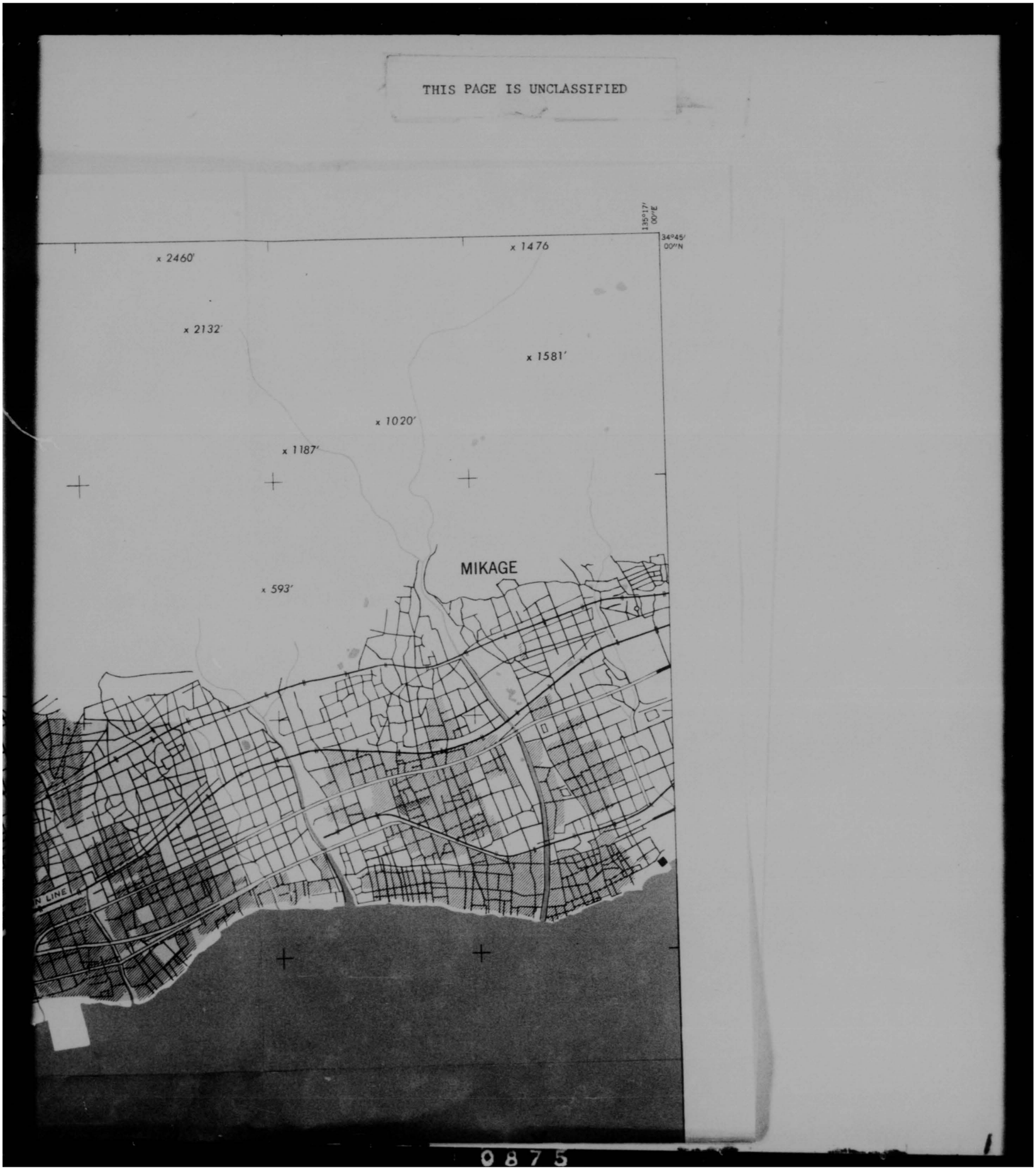
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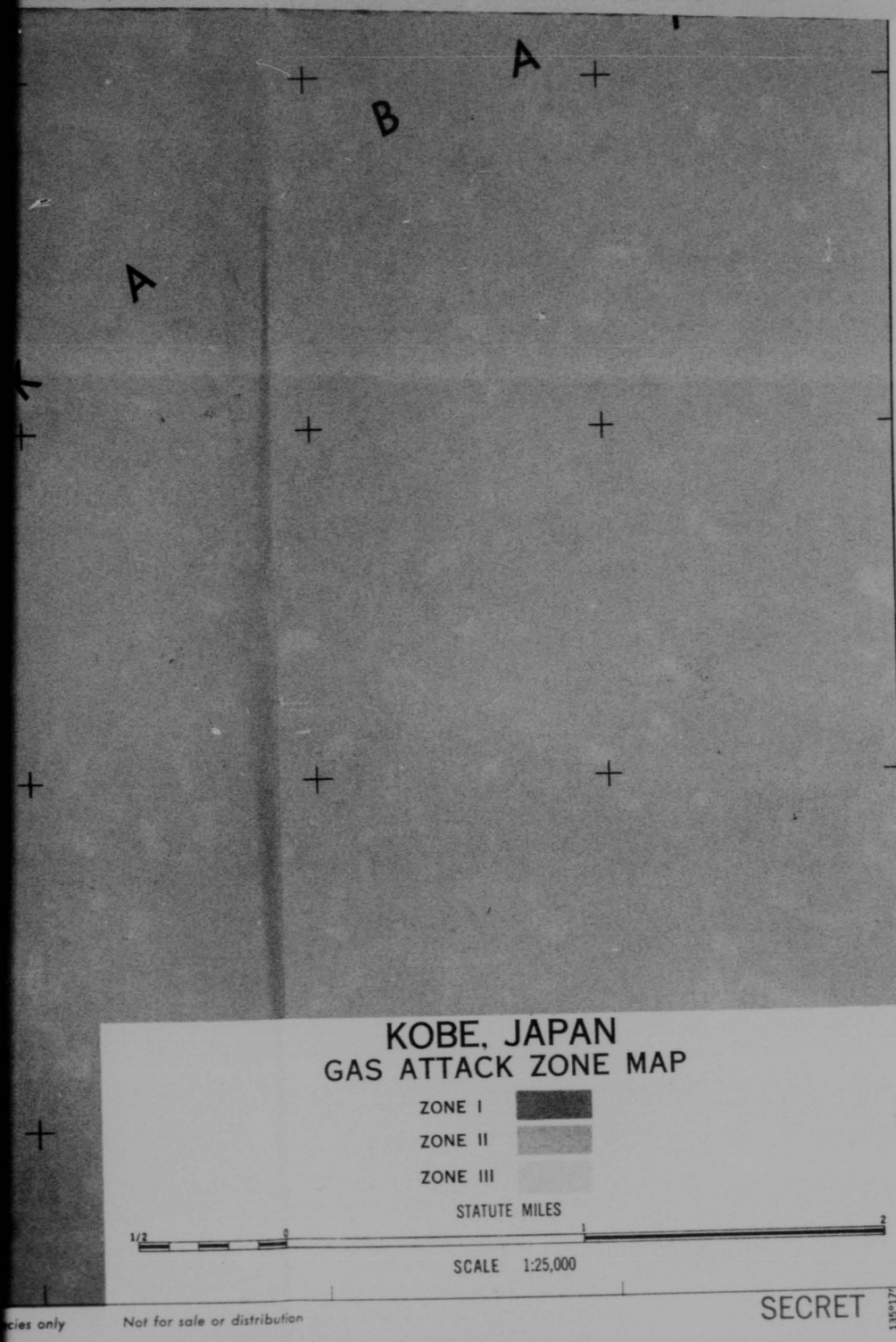
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KOBE, JAPAN
GAS ATTACK ZONE MAP

ZONE I

ZONE II

ZONE III

STATUTE MILES

1/2 0 1 2

SCALE 1:25,000

34°37' 30"N

135°17' 00"E

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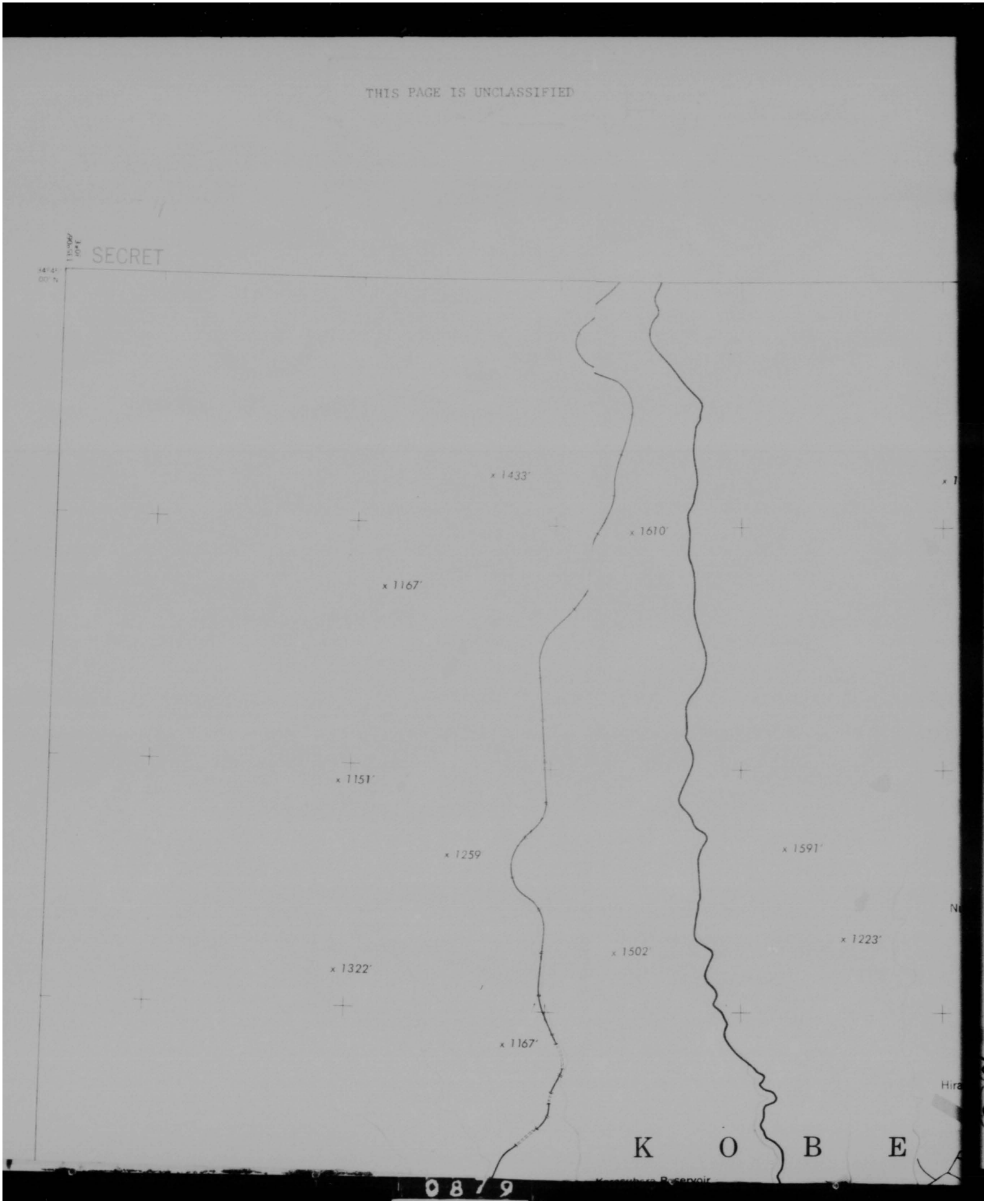
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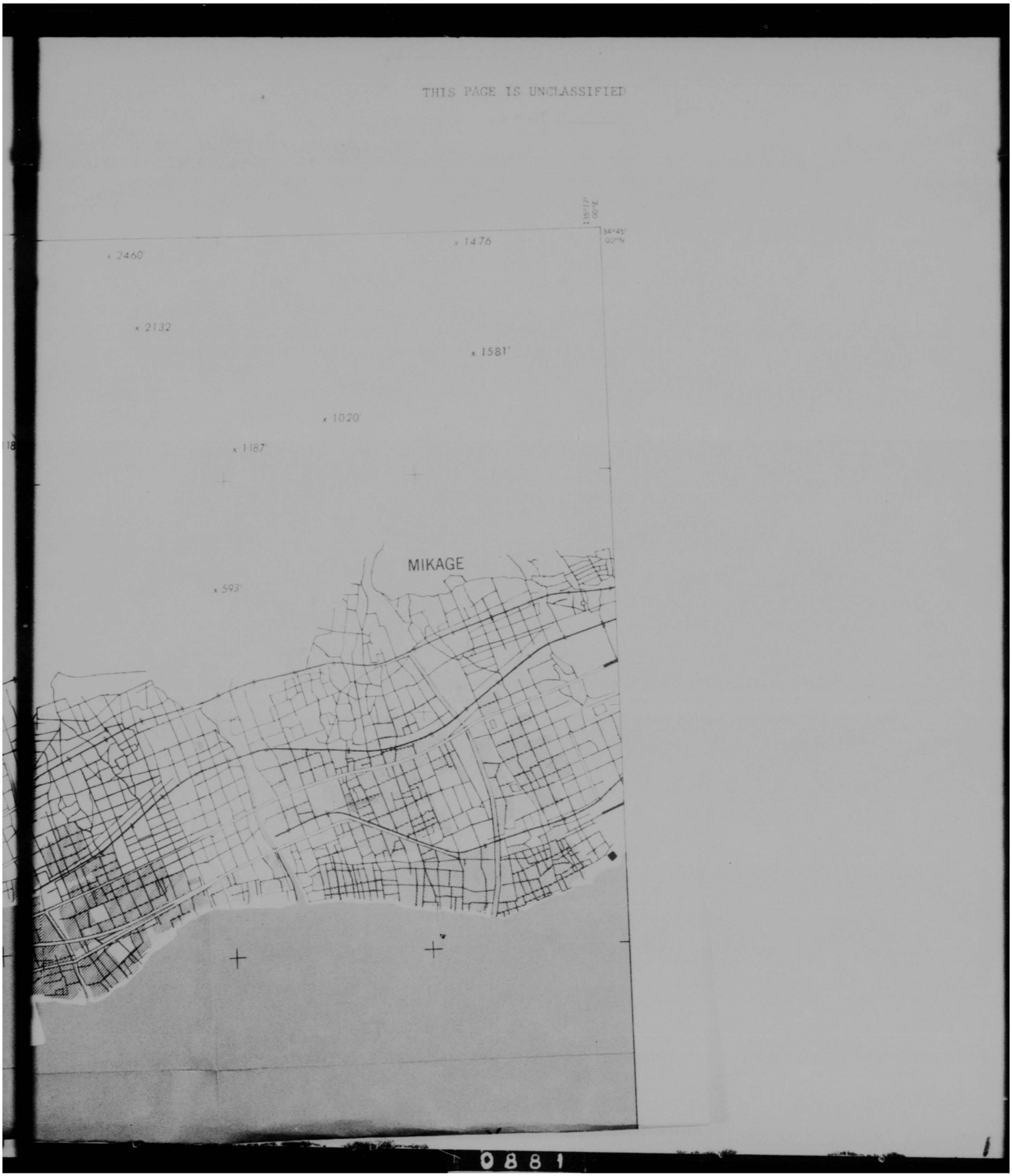
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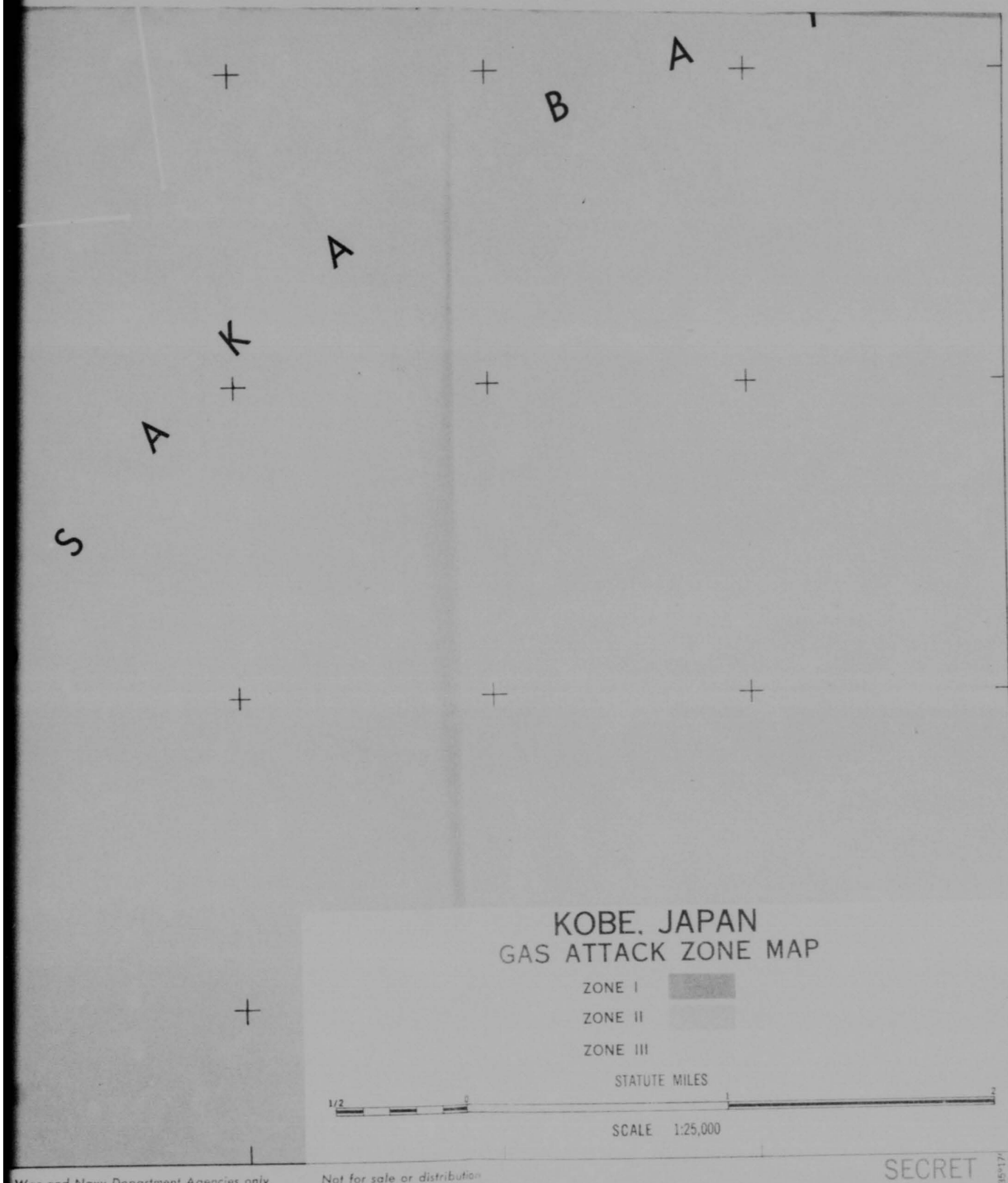


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KOBE. JAPAN
GAS ATTACK ZONE MAP

ZONE I

ZONE II

ZONE III

STATUTE MILES

1/2 0 1 2

SCALE 1:25,000

34°37'
30"N

135°17'
00"E

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5. KOBE

KEY AND PRIORITY TARGETS IN THE AREA

AAF Target No.	Target Name	Significance
	AIRCRAFT	
*10	Kawasaki Aircraft Factory	One of largest plane, engine plants.
*11	Kawasaki Dockyard Company Ltd Aircraft Works	One of largest plane, engine plants.
	ELECTRIC POWER	
4	Minatogawa Steam Power Plant	Secondary - 38,000 Kw.
	IRON AND STEEL	
*5	Kobe Steel Works Unit No. 1	Important, rptd 10% Japan output.
6	Kobe Steel Works Unit No. 2	Operates in conjunction with #5.
7	Kawasaki Dockyard Co. Steel Works	Important, steel for dockyard shipbuilding.
	TRANSPORTATION	
538	IGR Shops, Takatori	Very important repair & maintenance.
	RUBBER	
*14	Dunlop Rubber Works No. 1	Rptd over 30% tire mfg capacity of Empire.

*Priority Targets. See Japanese Target Data, Issued March, 1943

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6. YAWATA - TOBATA - WAKAMATSU

Population:

Yawata	261,309	(1940), (includes population of Kurosaki).
Wakamatsu	88,901	(1940).
Tobata	84,260	(1940).
Total	434,470	

Location - At the southwestern entrance to the Shimonoseki Strait, Latitude 33° 52' N., Longitude 130° 49' E.

Importance - Yawata is the site of the Imperial Iron and Steel Works, the largest steel plant in the Japanese Empire. This plant produces approximately 25% of Japan's pig iron and finished steel. Also located in the city are several chemical plants, coking plants and machinery works.

Wakamatsu, Japan's busiest commodity port, is especially important as an exporter of coal and an importer of iron ore, bauxite, coking coal, salt, etc. It is also an important industrial city, being the site of a large steel rolling mill, a synthetic oil plant, foundries, vegetable oil plants and a small shipyard.

Tobata is an industrial suburb of Yawata. It is the site of a large steel mill, a large shell and munitions plant, several large chemical and coking plants. It is also an important coal exporting port.

Kurosaki, a suburb of Yawata, is a new and increasingly important war production center, the site of Japan's second largest alumina plant, Japan's second largest nitrogen fixation plant, electric machinery works and several small steel fabricating plants.

Yawata and its satellite cities lie astride Japan's most heavily burdened railway freight system. Railroads serving these cities are taxed to capacity to carry a vast tonnage of coal from the coal fields in the south to the export port, and to carry the heavy tonnages of freight from the Port of Moji to the rest of Kyushu Island.

In many respects the industries located in these cities constitute the heart of Japan's war industry, comparable to those in Germany's Ruhr.

General Description:

YAWATA-Yawata City is easily identified by the maze of blast furnaces, coke ovens, ore and coal dumps which constitute the Imperial Iron and Steel Works. The north side of the plant site is distinctly marked by the inlet which forms the port of Yawata. A belt of railway lines extend along the south and east sides of the plant. The city proper is located between these railway lines and a chain of low hills which roughly parallel the railways, giving the city an "L"-shape. Although cut up by numerous wide streets and hilly park districts, the city is very congested and there are large areas completely covered with low, wooden dwellings. There is virtually no industry in this part of the city and no central business district comparable to that found in other cities of the same size. The only buildings above two or three stories are the company hospitals and schools and the municipal buildings. Most conspicuous landmark to the south of the city is the elevated Otani Reservoir.

TOBATA-Tobata, located directly N by E of Yawata, is a congested industrial city, distinctly outlined by low hills to the south and a river to the east. The blast furnaces of the Tobata plant of the Imperial

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6. YAWATA (Cont'd)

Iron and Steel Works, located along the waterfront to the north of the city, are conspicuous landmarks. The city is dingy and low-lying, and congested with flimsy worker' homes. Adjoining the steel works on the E side are workers' dormitories housing an estimated 8,000 perons. Virtually all the public buildings and larger stores are located between the steel plant and the conspicuous railroad freight yard to the south. An industrial belt extends along the waterfront toward Yawata. An immense coaling yard extends along the waterfront alongside the railroad yard.

WAKAMATSU - Wakamatsu is located on the small point of level land, just NW of Yawata, to the west of which lie 1000-foot hills. The city proper occupies a very small and densely built-up area. Several small settlements are situated in the valleys to the west of the city proper. An industrial district is located along the northern half of the waterfront. The southern half of the waterfront is covered with a maze of railway tracks, coal piles and mechanical coal loaders. Virtually all public buildings are situated in the east-central part of the city.

KUROSAKI - Kurosaki, situated along the railroad line which leads west out of Yawata, is a modern industrial suburb of Yawata. It occupies a small area centered around its railroad station and the streets are laid in a radial pattern around this station. Little is known concerning the appearance of this town, but it is believed to be congested. All the large industrial plants are situated on reclaimed land to the north of the railroad lines.

Gas Areas:

YAWATA - As indicated on the accompanying map, Yawata is divided into three areas.

Zone I - Zone I comprises the entire southern part of the city, and extends in a general E-W direction. With the exception of three elevated parks, this zone includes a virtually unbroken stretch of workers' homes. Most of the estimated 20,000 employees of the Imperial Iron and Steel Works live in this zone, many of them in densely clustered wooden and brick dormitories. Just north and NE of the Otani Reservoir are located the city's public buildings, manely the company hospital, city offices, post office and police headquarters. The only other conspicuous buildings in this area (most of brick or concrete construction) are a few schools and stores.

Zone II. - Zone II includes the eastern part of the city, a district entirely covered by workers' homes and dormitories. A chemical works and several units of the Imperial Iron and Steel Works (notably the plant's administration building) extend along the western part of this zone, near the railway tracks. Dense clusters of low wooden dormitories and homes characterize this zone.

Zone III. - This zone includes the main Imperial Iron and Steel Company plant and a large industrial area to the west located on made ground. A heavy concentration of new war industry is believed to be in this section.

TOBATA - Tobata has three areas.

Zone I - Zone I covers the most densely populated part of the city, including the commerical district along the western part. This zone is distinctly outlined by low hills to the south, a river to the east, the railroad yard to the west and a steel plant to the north. Included are the workers' dormitories to the east of the steel works. The southernmost part of the steel plant (a congested area of shops and warehouses) is also included in this zone.

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6. YAWATA (Cont'd)

Zone II - Zone II extends along the waterfront to the west of the city. This is primarily an industrial and warehouse district, and includes such objectives as large coking plants, a chemical plant, a munitions plant, a large textile mill and the city's freight yard and coaling wharves.

Zone III - This zone lies to the north of the city and includes a plant of the Imperial Iron and Steel Company and probable new war industries.

WAKAMATSU - There is one gas area, a Zone II area.

Zone II - Zone II stretches along the waterfront, extending inland to cover the most congested residential area. The northernmost portion, an industrial district, covers steel rolling mills, a shipyard and several small factories. Just south of this district, also along the waterfront, is Wakamatsu's commercial district. The southern part of this zone extends to Wakamatsu's coaling wharves, with their huge coal piles and mechanical coal loaders. Numerous warehouses are located along the railroad line.

KUROSAKI - There is one gas area, a Zone II area.

Zone II - A Zone II area lies some little distance south of the waterfront. Along the waterfront is a Zone III area concerning which little is known but which is believed to include many new war industries.

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Hills in this area rise to 1000 ft. Spot elevations unknown.

WAKAMATSU

HARBOR

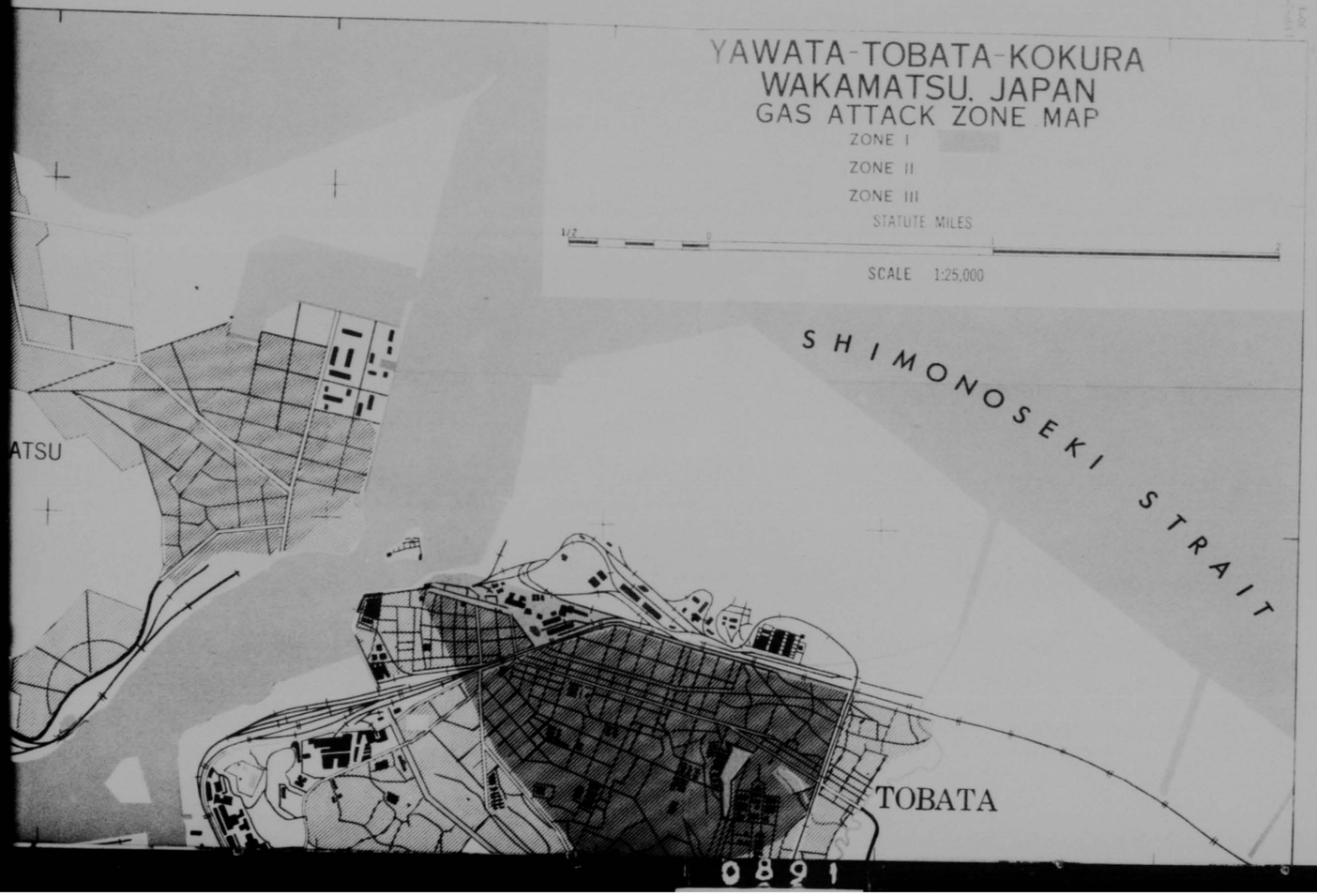
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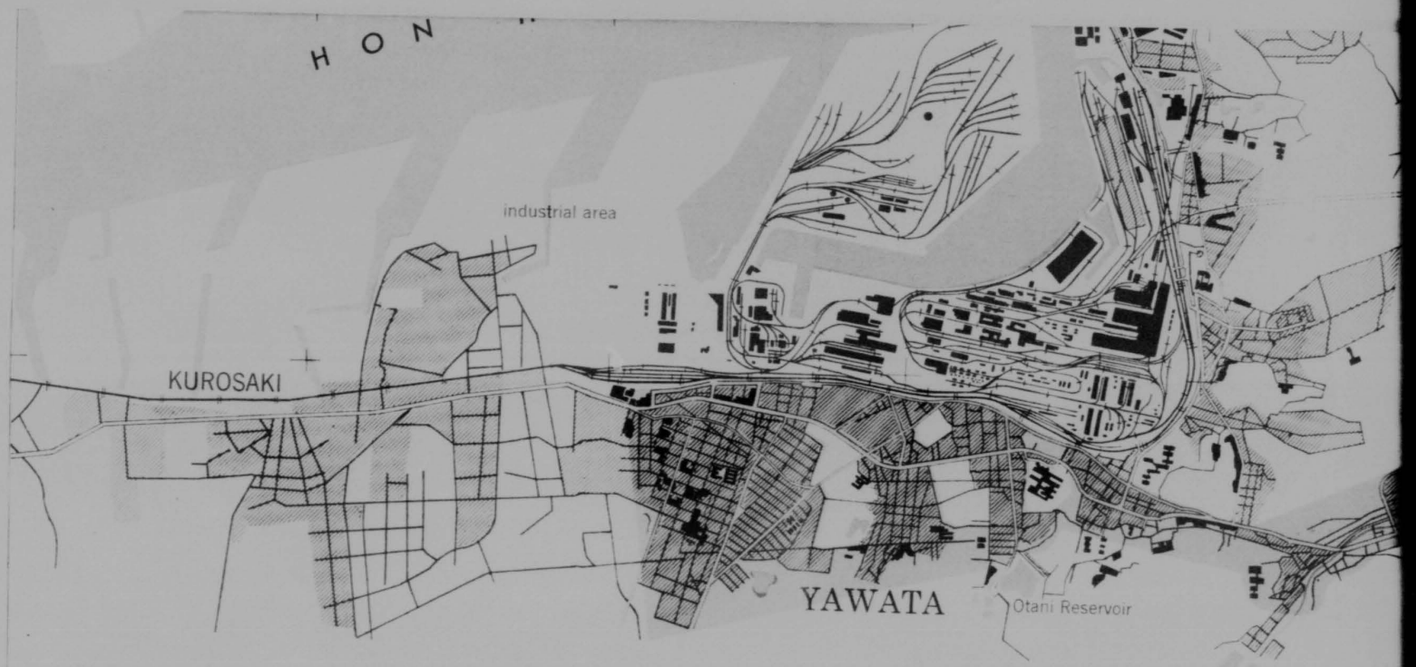


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6. YAWATA - TOBATA - WAKAMATSU

KEY AND PRIORITY TARGETS IN THE AREA

AAF Target No.	Target Name	Significance
	CHEMICALS	
*1123	Nihon Fertilizer Co. Kurosaki Plant	Important; fertilizer and war chemicals.
	IRON AND STEEL	
*28	Imperial Iron and Steel Works, Yawata Plant	Rated largest steel works in Empire.
29	Imperial Iron and Steel Works, Tobata Plant	Important steel and tinplate plant.
	NON-FERROUS METALS	
*1108	Japan Aluminum Company	Very important alumina plant, rptd nearly 20% Empire capacity.

*Priority Targets. See Japanese Target Data, Issued March, 1943

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7. KAWASAKI

Population - 300,777 (1940).

Location - Between Tokyo and Yokohama, Latitude 35° 31' N., Longitude 139° 42' E.

Importance - Although Kawasaki is a large, politically independent city, it is in effect a highly industrialized suburb of Tokyo. As a result of the development of its heavy industries, the population of the city has more than doubled in the past 10 years. Its major industries are:

1. Oil refineries (the three major refineries having over 10% of the capacity of all the Japanese-controlled refineries).
2. Electrical equipment (largest radio-telephone plants in Japan; important electrical equipment of all kinds).
3. Iron and steel (two major plants, of which the larger ranks third among all Japanese steel plants).
4. Machines and Tools (site of huge Shibaura Engineering Works, large producer of heavy electrical equipment, machinery, tools and munitions).
5. Rubber Tires (approximately 20% of total Japanese capacity).
6. Chemicals (fertilizers and basic chemicals).

Located on the waterfront are three large and several small steam power plants which generate virtually all the steam power used in the Tokyo area. The city is also a major railway transportation corridor, lying astride the busiest portion of the Tokaido Main Line.

General Description - The heavily built-up part of Kawasaki city is confined to a triangular area bounded by a huge railroad shunting yard on the west, the Tama River to the NE and three islands of reclaimed land on the waterfront to the south. Scattered concentrations of dwellings extend northwestward for three to four miles along the Tama River. With the exception of the large factories on the waterfront and a few public and commercial buildings, the city has relatively few substantial structures. The influx of over 100,000 persons during the past 10 years has led to a mushroom growth of cheap workers' homes, most of them concentrated just west of the bulge of the Tama River. A second concentration of residences is found just inland from the waterfront, in the Tsurumi district. While this district is politically a part of Yokohama, it is included here with Kawasaki since it constitutes a geographical extension of that city. Concentrated on Kawasaki's reclaimed waterfront are some of Japan's most vital munitions plants.

Geo Areas - Three areas are designated.

Zone I - Zone I, located west of the bulge of the Tama River, covers the most congested part of the city. This is a predominantly residential area, with numerous small factories along the Tokaido Railroad. Also along the railroad are Plants #1 and #2 of the important Shibaura Electric Co., key producer of electrical equipment of all kinds. The city's commercial district is located along the southern part.

Zone II - Zone II covers the densely built-up Tsurumi district, covered with Kawasaki's cheapest workers' homes. Kawasaki's largest factories are located on the waterfront, just south of this area. These factories are modern structures, many of reinforced concrete. Within Zone II, are located the key Yokohama Rubber Co. and several chemical and machinery plants.

Zone III - Zone III includes the waterfront area south of Kawasaki. Here is an extremely concentrated industrial area having large modern plants. Among the industries in this area are power plants, chemical plants, iron and steel plants and an aircraft parts factory.

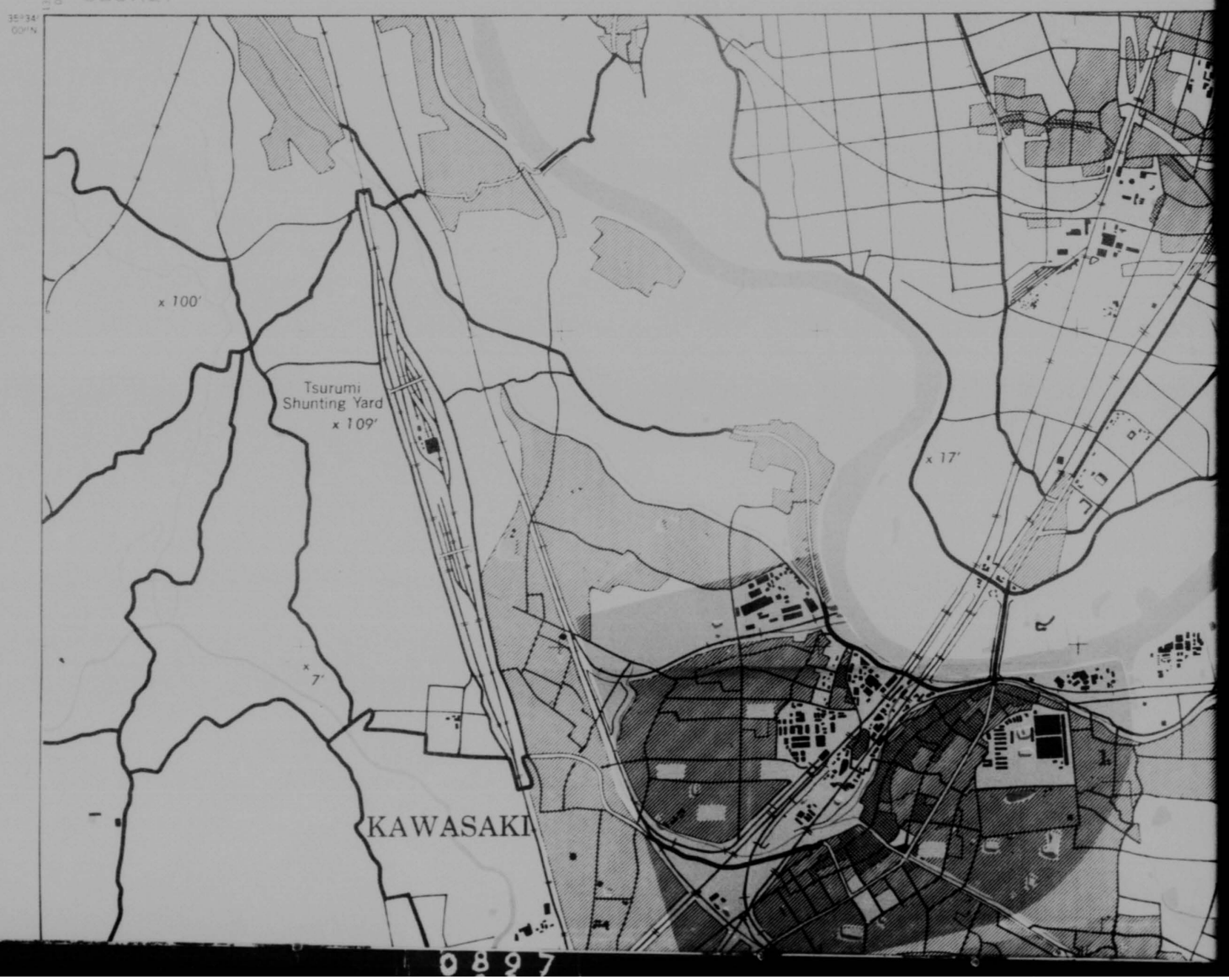
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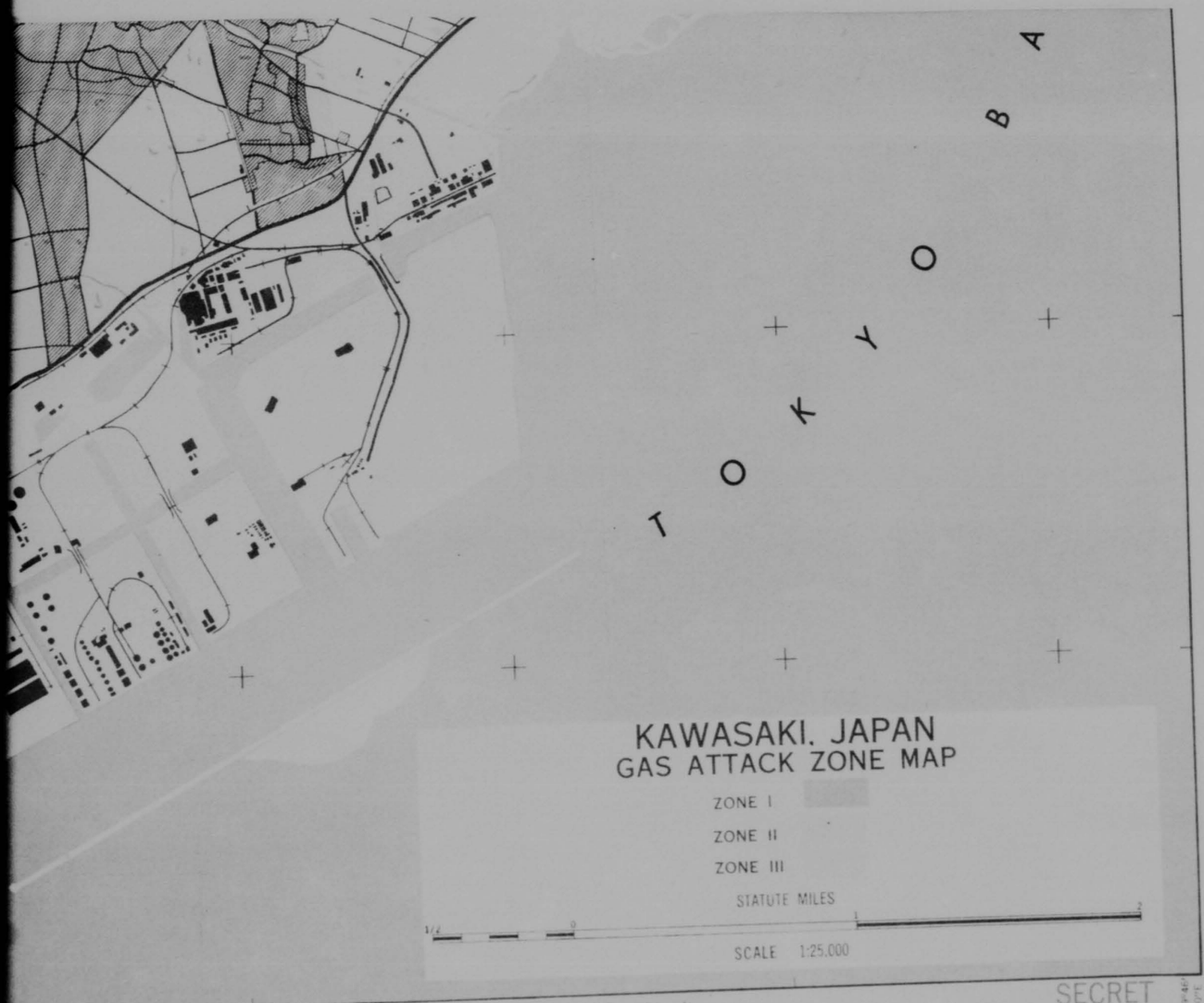
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7. KAWASAKI

KEY AND PRIORITY TARGETS IN THE AREA

AAF Target No.	Target Name	Significance
	CHEMICALS	
137	Showa Fertilizer	Vital importance; one of largest in Empire.
*134	Asahi Glass Company	Glass products of all kinds.
	COMMUNICATIONS	
497	Factory #1 of Nippon Electric Company	With #326 largest communications equipment mfr.
496	Factory #1 of Tokyo-Shibaura Electric Co.	Major radio-telephone equipment plant.
488	Factory #2 of Tokyo-Shibaura Electric Co.	Major radio-telephone equipment plant.
	ELECTRIC POWER	
110	Tokyo Electric Power Generating Station, Tsurumi Plant	One of area's 5 largest - 178,000 Kw (1936).
111	Kawasaki Electric Power Plant for Japanese Government Railways	Large, chief power source for Gov't railways of area.
493	Tokyo Steam Power Plant	One of area's 5 largest - 70,000 Kw.
	IRON AND STEEL	
52	Japan Steel Tube Co.	Rated most important steel plant in area.
51	Asano Iron Works	Iron, steel; supplies Tsurumi Steel and Shipbuilding.
	MACHINES AND MACHINE TOOLS	
133	Shibaura Engineering Works, Ltd.	Vital importance: electrical equipment, navy turbines, munitions.
	PETROLEUM	
*116	Mitsubishi Oil Refinery	Japan's largest; produces aviation gasoline, lubricants.
128	Petroleum Center	Four refineries & storage, aviation gasoline etc.
	RUBBER	
*141	Yokohama Rubber Company	Rptd 2nd most important rubber target Far East.

*Priority Targets. See Japanese Target Data, Issued March, 1943

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DECEMBER 1944

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CHIEF OF THE CHEMICAL WARFARE SERVICE
THE AIR CHEMICAL OFFICER
WITH THE ASSISTANCE OF
ASSISTANT CHIEF OF AIR STAFF, INTELLIGENCE
WASHINGTON, D. C.

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SELECTED AERIAL OBJECTIVES FOR RETALIATORY GAS ATTACK ON FORMOSA

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FOREWORD

These target folders were prepared with the view to furnishing chemical officers in the field with suitable general chemical warfare data which can be incorporated in objective folders of permanent key and priority tactical gas targets in Formosa. The material contained herein is based on currently available intelligence which in some cases is of a fragmentary nature. Such material is subject to modification as a result of changing conditions and as more recent and complete intelligence becomes available.

The scope of these folders is limited to (1) the selection of cities in which or near which there are suitable tactical gas targets (2) a brief description of general climatic and weather conditions, of the terrain, of population and built-up areas, and of the location of important objectives, (3) the presentation of maps and photographs of the cities.

Reference is made to "Selected Aerial Objectives for Retaliatory Gas Attack on Japan", April 1944 and WD Technical Bulletin CW-12, dated 24 July 1944, "Gas Munitions Requirements Data for Army Air Forces", for material relative to general capabilities of gas munitions, force requirements, etc.

The targets discussed herein were selected from a relatively large number of potentially suitable target areas. Information concerning additional target areas can be obtained from the references listed in each folder.

These target folders have been prepared jointly by the Chief of the Chemical Warfare Service, the Air Chemical Officer and Assistant Chief of Air Staff, Intelligence.

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TARGET SELECTIONS CONSIDERED

JCS 825/4 provides for strategic and tactical retaliatory gas attacks against appropriate targets in Japan proper, including the Ryukyus and Bonins, and for tactical retaliatory gas attacks against other areas in the Pacific. For obvious reasons, the targets in this study were further limited to permanent tactical installations. Other factors involved in the selection of potential targets for retaliatory gas attacks among the cities in Formosa include:

a. The changing tactical significance to Japan of the various military installations.

b. The relatively large number of potential targets and their widely scattered locations.

c. The size of the areas populated solely by Japanese.

d. The fragmentary nature of the available information concerning appropriate targets.

In general, the cities discussed in this report contain military installations of substantial importance to the Japanese war effort. It is indicated, however, that these cities do not include a decisive aggregate of such installations, and that the neutralization of these installations would probably have only local and temporary results. Each target is currently of primary significance to Japan's war effort but the availability of nearby alternate facilities in several cases would serve to lower considerably the effectiveness of attack.

It should be noted that, without exception, important military installations in these cities are located in or adjacent to districts of sparse settlements of native populations. An attempt has been made to describe:

a. The city wide population distribution in relation to specific objectives for possible gas attack.

b. Something of the terrain in the vicinity of these targets in order that some idea will be obtained as to the difficulties that accompany the conduct of operations in these areas.

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GENERAL - A EFFECT OF CLIMATE ON TARGET SELECTIONS

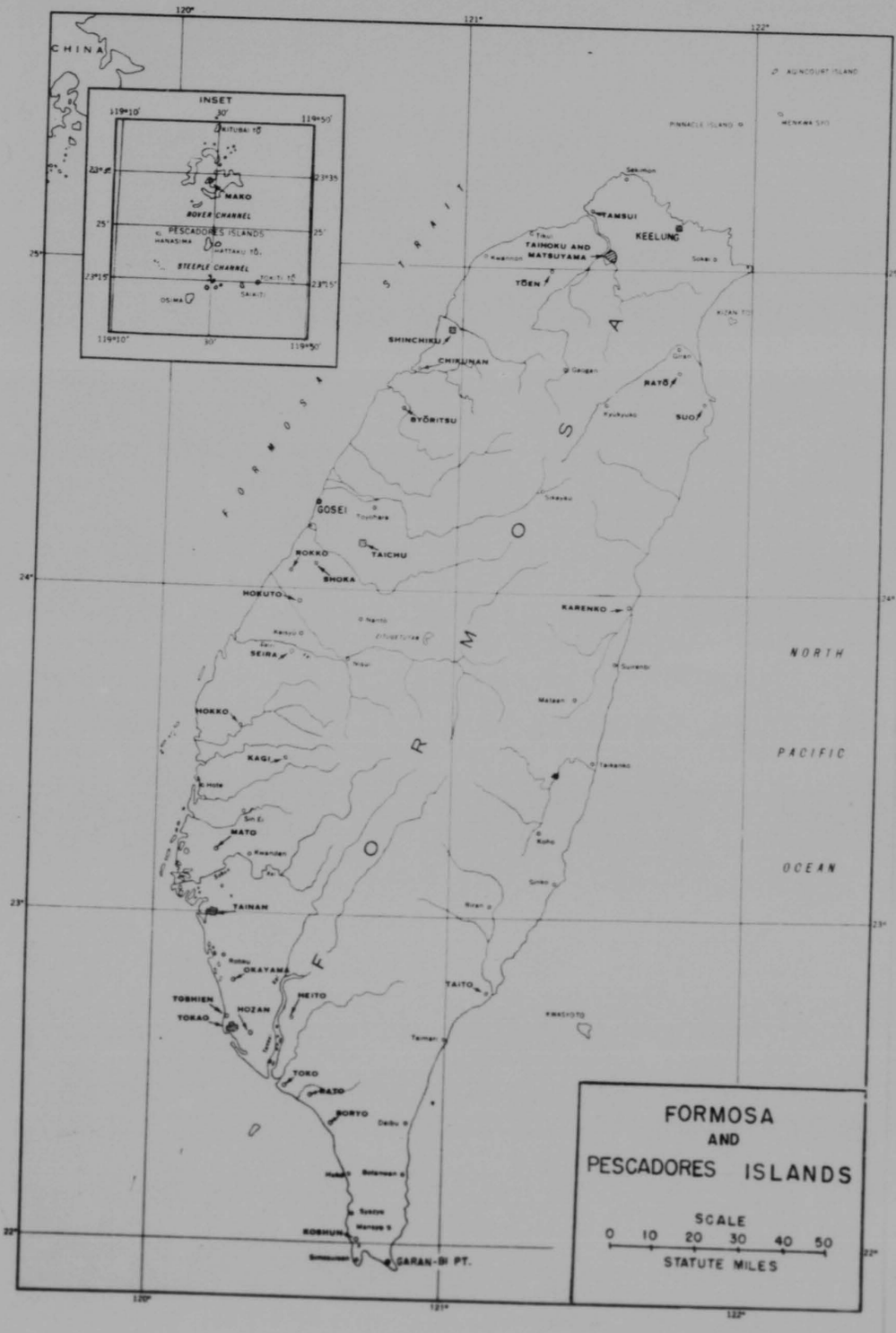
Weather conditions at the target are critical factors in determining the success of gas attack and the type of munitions (persistent or nonpersistent) to be used; this subject is discussed fully in Appendix A, "Selected Aerial Objectives for Retaliatory Gas Attack on Japan" dated April 1944, and will not be included herein.

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GENERAL - B GENERAL CLIMATIC DESCRIPTION

1. Formosa, which is bounded on all sides by warm tropical seas, possesses a climate which is essentially maritime during all seasons; characterized by mild to warm temperatures and moderate to heavy precipitation. In winter, the air flow over the islands is controlled almost exclusively by the great Asiatic anti-cyclone. From October through March the winds over east Asia blow clockwise out of a region of high pressure toward the continent and the resulting air flow over Formosa is predominately (about 87% of the time) from the east and northeast (the northeast monsoon); it is relatively warm and moist.

2. During the early part of the northeast monsoon season, the upper winds over Formosa are northeasterly up to a level lying between 6,000 - 12,000 feet, but this level lowers steadily and in April the northeast current is not more than 2,000 feet thick. Above the northeasterly current the wind becomes westerly. Average wind velocities increase gradually up to 18,000 feet where they average 22 m.p.h. From this level they decrease up to the elevation at which the westerly wind sets in, at approximately 10,000 feet; velocities in the westerly current average approximately 30 m.p.h.

3. During April and May there is a reversal of prevailing air flow from northeast to the quadrant between southwest and southeast; the Asiatic anti-cyclone is replaced by low pressure and Formosa comes under the influence of the clockwise circulation around the Pacific anti-cyclone. This summer flow (southwest monsoon) is not a persistent phenomenon as is the northeast flow of winter. The air during this period is very warm and moist and when heated over land areas during day time, convectional showers and thunder showers result. The southwest monsoon is usually fully established by the beginning of June.

During the southwest monsoon season, the upper winds from 2,400 feet to 10,000 feet are from south to west; above 10,000 feet easterly winds are prevalent. Wind velocities have only a slight tendency to increase with the elevation during the summer months and below 10,000 feet varies between 9 - 20 m.p.h.

During spring and autumn air flows alternate between the east and northeast to southwest to southeast.

The topography of Formosa has a pronounced effect on the local weather. The ridge of mountains trending north-northeast to south-southwest the entire length of the island exerts a powerful influence on the local air flow. As the prevailing northeast or southwest current of air moves up the windward slopes of the mountains, condensation and precipitation occur. The air moving down the leeward slopes is, however, dry and warm. Thus, the north and east slopes of Formosa are cloudy and rainy in winter, while the western slopes have relatively little cloud, and are warmer than the eastern slopes. Conversely, during the southwest monsoon, in summer, the maximum cloudiness and rainfall occur on the western and southern slopes. Along the coasts on both sides of the island December and January have a greater number of days with wind velocities greater than 22 m.p.h. than any other months of the year.

The high precipitation in certain seasons of the year, associated with the warm climate, mean humidities of approximately 80% and low wind speeds results in low rate of evaporation. Experiments indicate that mustard vapor is very effective under such conditions.

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Icing conditions constitute a hazard for low level air operations over Formosa only during the colder months under adverse conditions. At these times, the flying level will drop below the higher portions of the mountain range (7,000 - 10,000 feet), particularly over the northern portion of the island. During winter, the upper air temperature over Formosa decreases up to the upper limit of the northeast monsoon current, above which level they either increase with elevation or decrease at a slower rate, icing conditions are not likely to be encountered except when the top of the clouds layer is around 10,000 feet. Icing can always be avoided, however, by flying at low levels.

Below is a table (based on extrapolation of surface temperatures at a lapse rate of 0.6° C. per 100 meters) of the average height (in feet of freezing temperatures over the island:

	Dec - Mar	April	May	June	Jul-Sep	Oct	Nov
Northern Formosa	7,000 - 8,000	10,000	12,000	13,000	13,500	11,400	9,200
Southern Formosa	10,000	12,000	12,500	13,500	14,000	12,000	11,000

Low cloudiness and low ceilings over Formosa show considerable seasonal as well as aerial variations. In general, days with low cloudiness and low ceilings occur most frequently on the north and northeast coasts and decreases in number southward and westward. With respect to the seasons, the low cloudiness and low ceilings are most frequent on the north and east portions of the island during the winter months while during summer, they are most frequent over the interior mountains and south and southwestern slopes.

As a whole, the lower coastal portions are quite free from fog and other visibility producing factors. Occasionally during the winter, when rain has not fallen on the western slopes for a considerable period dust storms are produced over the western plains region at a time when winter monsoon blows with considerable force. The period of fog over the lowlands, extends from October through March but this is a matter of little concern because of the infrequency of the phenomenon. At higher elevations above 2,000 to 3,000 feet, fog is relatively more frequent.

It is impossible to present data on turbulence data on Formosa because no satisfactory method has been devised for presenting turbulence as a climatic factor other than in qualitative sense. Turbulence at the higher level of atmosphere is almost entirely a function of the degree of convective activity. Turbulence in the lower level of the atmosphere is governed by (1) surface wind speed and roughness of surface and (2) degree of superheating of the soil surface.

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GENERAL-5F

TAIHOKU--TANSUI DISTRICT

Easterly winds prevail in the Taihoku-Tansui district during the winter months. These dry winds descend the central mountain range. During June, July and August the direction of the wind is variable but predominantly they are from the east, southeast, west and northwest; from March through May the winds are predominantly from the east and the northeast; from September through November from the east and northeast.

Table I

Surface Wind Frequencies (%)

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	An.
N	3	3	4	5	5	5	5	5	4	2	2	2	
NE	16	15	16	17	16	9	9	12	22	22	21	20	
E	52	49	46	44	39	24	21	25	37	56	61	58	
SE	4	5	4	5	9	12	15	16	11	7	4	4	
S	3	4	3	3	5	8	10	10	7	3	2	2	
SW	4	4	4	3	4	9	11	8	4	2	2	2	
W	5	5	6	6	7	16	13	10	4	2	2	3	
NW	8	10	12	12	9	10	10	10	7	3	3	5	
Calm	5	5	5	5	6	7	5	4	4	3	3	4	

Table II

Mean Wind Speed (mph)

8	7	8	7	7	5	6	7	7	8	9	8	7

Mean relative humidity is rather uniform throughout the year and varies between 77 - 78% in the summer months to 84% in the winter months.

Table III

Mean Relative Humidity

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	An.
Percent	84	84	84	83	82	81	77	78	80	81	81	83	82

A higher number of clear and partly clear days occur in the summer time than at any other time. This phenomenon is despite the fact that the summer months constitute the rainy season in this portion of Formosa.

Table IV

Average Number Clear, Partly Clear and Cloudy Days

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Clear Day(0.00-0.19)	2	2	1	1	2	1	3	4	6	4	3	2
Partly Cloudy (0.20-0.79)	9	7	9	11	13	15	20	18	15	13	10	10
Cloudy (0.80-1.00)	20	19	21	18	16	14	8	9	9	14	17	19

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Fog occurs very rarely in this area but the greatest number of days occur in the winter time.

Table V-FOG

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	An
No. Days	2	2	2	1	1	1	*	*	*	1	1	1	12

*Less than 1/2 day.

Summer is the wet season and during this period the rain falls in rather heavy showers which occur on about half the days of each month.

Table VI

Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	An
No. Days with (0.004 in.)	16	17	17	15	16	15	14	15	14	15	15	16	186
Mean precipitation in.	3.4	5.3	6.7	6.4	8.9	11.1	8.3	11.8	10.2	5.3	2.7	3.0	83.1

Freezing temperatures occur rarely in this area. On the whole the temperature is uniform and usually varies from a mean minimum of 53° F in February to a mean maximum of 92° in July.

Table VII

Temperature °F

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	An.
Extreme Max.	86	87	91	95	98	99	101	99	97	95	91	88	101
Extreme Min.	37	32	40	46	50	60	67	66	56	51	34	35	32

The best method of approaching Taihoku is over the Taihoku landing beach and through the Taihoku-Tansui corridor. For this reason, it is believed pertinent to present the data on the precipitation in the Taihoku landing beach area and this data is contained in the table below:

Table VIII

Rainfall for Tansui Landing Beach

	An.	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Max in.per day	9.91	2.55	2.96	3.27	5.06	9.91	7.32	5.91	7.43	9.45	6.06	3.15	2.6
Av. No. rainy days	165.6	16.5	16.2	18.5	12.7	12.7	10.9	8.6	10.0	10.6	12.7	14.9	16.

Summer is the most favorable for low level bombing operations whereas autumn is the most favorable for high visual bombing operations. Although chemical warfare can, in general, be conducted effectively throughout the year, summer is the most favorable season.

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GENERAL D

TAKAO - HOZAN - HEITO

In this area, the north and northeast winds prevail during the winter season. They are dry winds which have crossed the central mountain ranges. The winds during the summer time are variable but are predominantly from the southwest and south. From March to May the winds generally predominate from north to northwest, and from September to November, from the north to northwest.

Table I

Surface Wind Frequencies (%)

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Ann.
N	67	68	55	44	28	8	8	10	24	42	61	73	
NE	13	11	11	11	9	5	7	6	11	13	12	10	
E	2	1	3	4	7	12	14	14	14	5	2	1	
SE	1	2	3	4	10	24	20	21	11	4	1	1	
S	1	1	3	5	7	20	15	12	6	2	1	0	
SW	1	1	4	6	10	15	13	12	6	3	1	0	
W	2	2	5	9	13	9	11	11	11	8	3	2	
NW	12	13	14	14	12	5	9	10	13	18	16	12	
Calm	1	1	1	3	4	2	3	4	4	5	3	1	

Table II

Mean Wind Speed (mph)

9	9	8	7	6	6	6	6	6	7	7	8	7

During the northeast monsoon there are a greater number of clear days and partly cloudy days than the rest of the year. During months of the northeast monsoon there is an average per month of 5 to 8 clear and of 15 to 17 partly cloudy days.

Table III

Mean Number Clear, Partly Cloudy and Cloudy Days

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Clear Day (0.00-0.19)	6	5	5	5	5	2	2	2	4	8	7	7	
Partly Cloudy (0.20-0.79)	16	17	16	17	15	17	19	16	20	16	16	15	
Cloudy (0.80-1.00)	8	8	9	8	10	11	9	12	6	6	7	8	

The relative humidity is generally higher in summer than in winter.

Table IV

Mean Relative Humidity

%	73	73	74	75	77	81	82	83	88	77	75	74	77

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Fog is very rare in this region but occurs more frequently in the winter than any other time of the year.

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
No. Days	2	2	2	1	*	*	*	*	*	1	1	1	10

*Less than 1/2 day.

Summer has the wettest months of the year; winter the dryest. More than 5 inches of rainfall is received during each summer month; this precipitation results from rather heavy showers which occur on about half the days of each month.

Table VI

Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
No. Days with (0.004 in)	3.6	3.6	4.9	5.6	9.6	12.9	14.6	17.8	10.0	4.0	2.5	2.9	91.7
Mean (in)	0.7	0.7	1.4	1.8	6.4	11.8	13.5	16.3	5.6	1.8	0.9	0.3	61.1

Freezing temperatures are rare in this area; the winters are rather mild.

Table VII.

Temperature °F

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Extreme Max.	90	90	96	94	96	95	98	98	98	94	95	90	98
Extreme Min.	37	36	42	53	58	66	70	70	60	55	37	40	36

Autumn is the most favorable season for all type bombing operations. It is also the most favorable season for conducting chemical warfare. However, in general, it is feasible to conduct gas warfare throughout the balance of the year.

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GENERAL - E

TAINAN - OKAYAMA

Northerly winds predominate in this area during the winter season. During the summer, the winds are predominantly from the southeast and south. In the spring and autumn of the year, the winds are predominantly from the north and northwest, with a greater variation during the autumn.

Table I

Surface Wind Frequencies(%)

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
N	57	68	56	44	28	8	8	10	24	42	61	73
NE	13	11	11	11	9	5	7	6	11	13	12	10
E	2	1	3	4	7	12	14	14	14	5	2	1
SE	1	2	3	4	10	24	20	21	11	4	1	1
S	1	1	3	5	7	20	15	12	6	2	1	1
SW	1	1	4	6	10	15	13	12	6	3	1	0
W	2	2	5	9	13	9	11	11	11	8	3	2
NW	12	13	14	14	12	5	9	10	13	18	16	12
Calm	1	1	1	3	4	2	3	4	4	5	3	1

Table II

Mean Wind Speed (m.p.h.)

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Ann.
9	9	8	7	6	6	6	6	6	7	7	8	7

January and February have a greater average number of days which have wind velocities in excess of 22 m.p.h. than any other months.

There are a greater number of clear and partly cloudy days during the winter time than during the summer.

Table III

Average Number Clear, Partly Clear and Cloudy Days

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Clear Day (0.00-0.19)	6	5	5	5	5	2	2	2	4	8	7	7
Partly Cloudy (0.20-0.79)	17	18	17	18	16	18	20	17	21	17	17	16
Cloudy (0.80-1.00)	8	8	9	8	10	11	9	12	6	6	7	8

Fog is rare but is more frequent in the winter than any other time of the year.

Table IV

Fog (No. of Days)

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ann.
2	2	2	1	*	*	*	*	*	1	1	1	10

*Less than 1/2 day.

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In general the humidity is rarely uniform and the mean humidity varies from 77° in November to 84° in August.

Table V

Mean Relative Humidity (%)

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ann.
78	79	79	78	80	83	82	84	81	78	77	78	80

Winter is the dry season in this area; summer is the wet. Rain falls in rather heavy showers which occur on about half the days of each month.

Table VI

Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
No. Days with (0.004 in).	5	6	6	8	10	15	16	19	11	5	4	4	107
Mean precipitation in.	0.9	1.5	1.6	2.5	7.4	13.5	12.7	16.8	6.5	1.4	0.7	0.5	66.1

Freezing temperatures in this area are very rare, and, in general, the winters are very mild with mean daily temperatures of 62° F. - 65° F.

Table VII

Temperature °F

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Extreme Max.	90	90	96	94	96	95	98	98	98	94	95	90	98
Extreme Min.	37	36	42	53	58	66	70	70	60	55	37	40	36

Autumn is the most favorable for all types of air operations; it also is the most feasible season for conducting chemical warfare. However, in general, gas warfare can be effectively conducted throughout the remainder of the season.

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GENERAL F

KEELUNG - (KIIRUNG) FORMOSA

Northeasterly and northerly winds prevail at Keelung during the winter time; during the summer months, the winds are variable but predominantly southwesterly and southerly. These winds are dry winds. In the spring and autumn, the winds are predominantly northeasterly, northerly and easterly.

Table I

Surface Wind Frequencies (%)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Ann.
N	25	27	24	22	13	10	8	9	15	15	19	21	
NE	30	28	24	22	21	12	8	10	20	39	37	35	
E	16	13	14	16	20	16	16	19	23	23	23	19	
SE	4	5	5	6	8	9	13	13	11	6	6	5	
S	7	6	8	10	13	17	19	17	11	6	5	6	
SW	8	9	9	9	12	22	23	19	9	4	4	6	
W	2	2	3	3	3	4	4	3	2	1	1	1	
NW	6	8	11	8	6	6	5	6	5	3	3	5	
Calm	1	2	2	4	4	4	4	4	4	3	2	2	

Table II

Mean Wind Speed (m.p.h.)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Ann.
10	10	9	7	6	6	7	7	8	9	10	10	8

July, August and September have the greatest average number of clear and partly cloudy days. These months have a minimum of 5 - 6 clear and 14 - 18 cloudy days.

Table III

Average No. Clear, partly clear and cloudy days

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Clear Day (0.00-0.19 cloud cover.	1	1	1	1	1	2	2	6	5	5	2	1	1
Partly cloudy(0.20-0.79)cloud cover	8	5	7	10	11	14	17	18	14	12	6	6	
Cloudy (0.90-1.00) Cloud cover)	22	22	23	19	18	14	8	8	11	17	23	24	

Fog is very rare in this area but occurs most frequently during January, February and March.

Table IV

Fog

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
No. Days	1	1	2	1	*	*	0	0	0	*	*	*	5

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Mean relative humidity is rather uniform in this area and ranges from a minimum of 82% in July to a maximum of 88% during the month of March.

Table V

Mean Relative Humidity(%)

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Ann
85	85	88	87	86	84	82	84	84	83	83	84	84

Summer is the dry season in this area; winter, the wet. The rain falls in small amounts on a high percentage of days giving little opportunity for the drying out of the soil and equipment.

Table VI

Precipitation

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Ann.
Clear - No. days with 0.004 in.	22	21	23	19	19	14	11	14	17	20	22	23	224
Mean amt. in.	13.9	11.4	13.9	7.6	12.1	8.7	5.8	6.9	10.9	10.9	13.0	15.4	130.4

In fourteen years the lowest reported temperature is 43° F. and the highest, 98°F. Actually these extreme temperatures occur rarely and the temperature is rather uniform and varies from a mean daily maximum of 89° in July to a mean daily minimum of 55° in February.

Table VII

Temperature °F

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Extreme Maximum	83	81	85	88	92	97	97	98	95	90	87	82	98
Extreme Minimum	46	43	46	49	58	64	71	71	60	58	49	47	43

Autumn is the most favorable for all type air operations. Summer is the most favorable season for chemical warfare operations, in general, they can be conducted effectively during the remainder of the year.

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GENERAL-"G

KAGI

Northerly winds prevail at Kagi during the winter; variable winds prevail during the summer but they are predominantly southeasterly and southerly. During the spring and autumn the winds are predominantly northerly and northwesterly. December and January have a greater average number of days with wind velocities greater than 22 m.p.h. than any other months.

Table I

Surface Wind Frequencies (%)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
N	67	68	56	44	28	8	8	10	24	42	61	73	
NE	13	11	11	11	9	5	7	6	11	13	12	10	
E	2	1	3	4	7	12	14	14	14	5	2	1	
SE	1	2	3	4	10	24	20	21	11	4	1	1	
S	1	1	3	5	7	20	15	12	6	2	1	1	
SW	1	1	4	6	10	15	13	12	6	3	1	0	
W	2	2	5	9	13	9	11	11	11	8	3	2	
NW	12	13	14	14	12	5	9	10	13	18	16	12	
Calm	1	1	1	3	4	2	3	4	4	5	3	1	

Table II

Mean Wind Speed (m.p.h.)

9	9	8	7	6	6	6	6	6	7	7	8	7

During the northeast monsoon there are a greater number of clear and partly cloudy days than during the southwest monsoon period.

The relative humidity is rather uniform throughout the year and is about 80%.

Fog is rare in this area but most frequent during the winter months.

Table III

Fog

Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
2	2	2	1	*	*	*	*	*	1	1	1	10

*Less than 1/2 day.

Winter in this area is the dry season; summer the wet. Over 14" of rain falls during each summer month. This heavy precipitation results from heavy showers which occur on about half the days of each month.

Table IV

Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
No. Days with(0.004 in.)	5.3	4.3	7.4	6.7	10.3	13.9	16.9	17.7	11.0	4.1	2.9	3.3	103.9
Mean Precipitation (in.)	1.2	1.1	2.3	3.4	7.2	14.1	16.5	17.0	8.6	1.4	0.9	0.6	74.2

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Freezing temperatures occur very rarely in this area and usually the winters are very mild. The mean daily minimum temperatures vary from 55° F during the winter to about 75° F in the summer; the mean daily maximum temperature varies from about 74° F in the winter to about 89° F in the summer.

Autumn is the most favorable season for all types air operations. Chemical warfare operations, in general, can be conducted effectively throughout the year; autumn is the most favorable season.

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Freezing temperatures occur very rarely in this area and usually the winters are very mild. The mean daily minimum temperatures vary from 55° F during the winter to about 75° F in the summer; the mean daily maximum temperature varies from about 74° F in the winter to about 89° F in the summer.

Autumn is the most favorable season for all types air operations. Chemical warfare operations, in general, can be conducted effectively throughout the year; autumn is the most favorable season.

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GENERAL - H

TAICHU-GOSEI-TOYOHARA

From October through March the prevailing winds in this area are from the north. These winds are dry. During the months of June, July and August the winds are variable but predominate from the south and southwest. During April, May, and September the winds are predominantly from the north and northwest. The winter months have a greater average number of days with a wind velocity in excess of 22 mph than at any other time during the year. This average number of days, however, rarely exceeds 5 days in any one of these months.

Table I

Surface Wind Frequencies (%)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
N	56	58	50	38	25	11	11	11	30	50	54	61	
NE	9	7	6	6	5	3	4	6	8	9	12	10	
E	3	2	2	3	4	4	6	7	7	3	2	2	
SE	1	1	1	2	5	9	9	10	5	1	1	1	
S	1	1	3	6	10	24	21	18	7	2	1	1	
SW	2	2	3	6	9	17	13	12	5	3	1	1	
W	3	3	6	9	10	9	10	9	7	5	3	2	
NW	8	10	13	13	13	7	10	11	13	10	9	6	
Calm	17	16	16	17	19	16	16	16	16	17	17	16	

Table II

Mean Wind Speed (m.p.h.)

5	5	5	4	3	4	4	4	4	4	5	5	4

From September through February there are from 5 - 9 clear and from 12 to 20 partly cloudy days.

Table III

Average Number Clear, Partly Clear and Cloudy Days

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Clear Day (0.00-0.19)	6	5	3	2	2	2	2	2	5	9	9	8
Partly Cloudy (0.20-0.79)	15	12	15	16	16	16	20	19	20	16	14	16
Cloudy (0.80 - 1.00)	10	11	13	12	13	12	9	10	5	6	7	7

The mean relative humidity is rather uniform and is approximately 80%. Fog is rather rare in this area and occurs most frequently during the winter. Winter is the dry season, summer is the wet season and the rain falls in rather heavy showers on about one half the days of each month.

Table IV

Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
No. days with (0.004 in.)	8	10	12	11	13	16	15	18	9	4	5	7	128
Mean Precipitation (in)	1.4	2.6	3.9	5.1	9.5	13.4	10.5	12.9	6.2	1.0	0.8	0.9	68.1

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Freezing temperatures occur rarely in this area. There have been a few instances of the temperature going over 100° in the summer time. In general, the temperatures in the area are moderate.

Table V

Temperature °F

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Extreme Max.	88	88	91	92	95	98	98	103	96	96	92	89	103
Extreme Min.	35	30	41	50	51	62	69	68	58	53	35	35	30

Summer is the most favorable season for low level bombing operations; autumn, for high level bombing operations. Autumn is the season most favorable for chemical warfare operations; in general, they can be conducted effectively during the remainder of the year.

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GENERAL - I SHINCHIKU

Northerly winds prevail at Shinchiku from November through March; there is approximately 16% to 17% of calm during this period. During June, July and August winds are variable but predominantly southerly and southwesterly with about 16% calm. During April, May, September and October the winds are highly variable, but predominantly with about 17 - 19% calm.

Table 1. -- Summary Weather Conditions, Surface Wind Frequencies (%)

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
N	56	58	50	38	25	11	11	11	30	50	54	61
NE	9	7	6	6	5	3	4	6	8	9	12	10
E	3	2	2	3	4	4	6	7	7	3	2	2
SE	1	1	1	2	5	9	9	10	5	1	1	1
S	1	1	3	6	10	24	21	18	7	2	1	1
SW	2	2	3	6	9	17	13	12	5	3	1	1
W	3	3	6	9	10	9	10	9	7	5	3	2
NW	8	10	13	13	13	7	10	11	13	10	9	6
Calm	17	16	16	17	19	16	16	16	18	17	17	16

Table 2. -- Mean Wind Speed (m.p.h.)

An	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
4	5	5	5	4	3	4	4	4	4	4	5	5

The amount of cloudiness is much greater in summer than in winter. From October through February there is a mean average of 5 to 9 clear and 12 to 16 partly cloudy days.

Table 3. -- Average Number Clear, Partly Clear and Cloudy Days

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Clear Day (000-0.19)	6	5	3	2	2	2	2	2	5	9	9	8
Partly Cloudy (0.20-0.79)	15	12	15	16	16	16	20	19	20	16	14	16
Cloudy (0.80-1.00)	10	11	13	12	13	12	9	10	5	6	7	7

The mean relative humidity is rather uniform in this area throughout the year and averages about 80%. Fog is rare and occurs most frequently from November through March.

Autumn is the driest season of the year; spring, the wettest. The rain falls in rather heavy showers which occur on about 1/3 the days of every month.

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Table 4. -- Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	An
No. days with (0.004 in.)	6.9	9.3	13.6	9.8	9.6	7.7	7.0	7.9	5.3	3.4	4.7	8.0	93.2
Mean Precipitation (in.)	2.9	4.7	6.1	5.2	8.7	5.2	4.9	5.9	4.0	1.8	1.6	1.8	52.6

Freezing temperatures are rare in this area and when such periods do occur they are of short duration.

Autumn is the season most favorable for all type of air operations. It is also the most favorable season for the conduct of chemical warfare operations; in general they can be conducted effectively during the remainder of the year.

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GENERAL - J

Northerly winds predominate at Toko from November through March; these are dry winds. Winds are variable during the months of June, July and August but predominantly they are southeasterly, southerly and southwesterly. During April, May, September and October the winds are predominantly northerly and northwesterly.

Table 1. -- Surface Wind Frequencies (%)

	An	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
N	67	66	56	44	28	8	8	10	24	42	61	73	
NE	13	11	11	11	9	5	7	6	11	13	12	10	
E	2	1	3	4	7	12	14	14	14	5	2	1	
SE	1	2	3	4	10	24	20	21	11	4	1	1	
S	1	1	3	5	7	20	15	12	6	2	1	0	
SW	1	1	4	6	10	15	13	12	6	3	1	0	
W	2	2	5	9	13	9	11	11	11	8	3	2	
NW	12	13	14	14	12	5	9	10	13	18	16	12	
Calm	1	1	1	3	4	2	3	4	4	5	3	1	

Table 2. -- Mean Wind Speed (m.p.h.)

An	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec.
7	9	9	8	7	6	6	6	6	6	7	7	8

Amount of cloudiness is much greater during the summer than at any other time of the year; there is a mean monthly average of from 5 to 7 clear and 15 to 17 partly cloudy days during the northeast monsoon.

Table 3. -- Mean Number Clear, Partly Cloudy and Cloudy Days

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Clear Day (0.00-0.19)	6	5	5	5	5	2	2	2	4	8	7	7
Partly Cloudy (0.20-0.79)	16	17	16	17	15	17	19	16	20	16	16	15
Cloudy (0.80-1.00)	8	8	9	8	10	11	9	12	6	6	7	8

The mean relative humidity is uniform throughout the year and varies from about 73 to 86%. Fog is rare in this area but occurs more frequently in months of January, February and March.

At Toko winter is the dry season; summer, the wet. The rain falls during the summer months in rather heavy showers which occur on about half the days of each month.

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Table 4. -- Precipitation

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Ann
No. Days with Precipitation (0.004 in.)	3.5	3.1	4.8	4.5	9.3	12.1	17.1	16.1	13.2	6.4	3.3	2.6	96.0
Mean Precipitation (in)	0.9	0.9	1.7	2.2	6.2	13.0	19.4	16.7	7.5	2.7	0.6	0.4	74.2

Freezing temperatures rarely occur in this area and when they do they are of short duration. In general, the temperatures are moderate.

Autumn is the most favorable season for all type of air operations and for chemical warfare operations; in general, both can be conducted effectively during the remainder of the year.

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GENERAL - K

KARENKO

Winds in Karenko are variable throughout the year but are predominantly from the north and northeast during the winter months and from the south and southwest during the summer months. There are a greater number of land and sea breezes in the summer than at any other time of the year.

Table 1. -- Surface Wind Frequencies (%)

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Ann
N	21	22	31	21	23	14	8	8	18	26	26	21	
NE	30	27	22	18	21	13	6	9	17	28	26	33	
E	4	4	5	6	7	10	14	11	8	5	4	2	
SE	1	4	5	11	6	14	16	13	6	2	3	2	
S	2	4	4	8	4	6	9	8	12	3	3	3	
SW	10	11	9	11	8	14	17	19	13	10	16	18	
W	21	16	14	19	16	17	18	19	15	15	13	11	
NW	9	11	10	5	12	10	10	12	10	11	9	9	
Calm	2	1	0	1	3	2	2	1	1	0	0	1	

Table 2 - Mean Wind Speed (m.p.h.)

Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Ann
6	6	6	5	4	4	5	4	5	6	6	6	5

December and January have a greater average number of days with a wind velocity in excess of 22 m.p.h. than any other months of the year. The amount of cloudiness is greater during the winter than in summer. From June through August there is a mean average of 1 to 4 clear and 13 to 16 partly cloudy days.

Table 3. -- Average Number Clear, Partly Clear and Cloudy Days

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Clear (0.00-0.19)	0	0	0	1	1	1	4	2	1	1	1	0	
Partly Cloudy (0.20-0.79)	5	4	7	6	9	13	16	16	14	12	9	9	
Cloudy (0.80-1.00)	26	24	24	23	21	16	11	13	15	18	20	22	

Mean relative humidity varies from about 76% during October, November and December to 84% in May and June. A record has been kept of the weather conditions at this station for about three years and during this period no foggy days have been recorded.

Table 4. -- Mean Relative Humidity

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Ann
%	78	81	80	82	84	84	81	82	80	76	76	76	80

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At Karenko winter is the dry season, summer, the wet. The frequency of precipitation during the first six months of the year is greater than the last of the year.

Table 5. -- Precipitation

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Ann
No. days with (0.004 in.)	20	20	19	20	22	19	12	14	17	13	15	15	204
Mean Precipitation in.	2.3	4.6	4.1	7.7	10.7	7.0	10.6	8.7	12.8	8.7	3.3	2.2	826

Eight years temperatures have been recorded at this station. The minimum temperature recorded is 44° F whereas the mean daily minimum temperature during this same period is 58° F. In general, the diurnal temperature range is greater in winter than in summer.

Table 6. -- Temperature °F..

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Extreme Max.	85	82	84	87	92	92	94	95	94	89	85	83	95
Extreme Min.	49	48	51	54	60	64	69	69	65	54	47	44	44

Summer is the best season for all types of air operations, whereas autumn is the most favorable for chemical warfare. Generally, however, chemical warfare operations can be conducted effectively during the remainder of the year.

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GENERAL - L. MAKO

From September through May prevailing winds at Mako are from the northeast and the north. From June through August prevailing winds are from south and southwest.

Table 1. -- Surface Wind Frequencies (%)

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
N	28	30	24	24	24	9	12	14	30	31	34	31	
NE	68	64	60	49	34	15	7	9	38	61	65	68	
E	1	2	2	3	3	2	2	2	2	1	0	0	
SE	0	1	1	3	2	7	7	8	3	1	0	0	
S	1	1	4	8	15	38	31	23	8	2	0	0	
SW	1	1	4	6	12	22	25	24	6	1	0	0	
W	0	0	2	3	5	4	8	11	6	1	0	0	
NW	1	1	2	3	4	2	7	8	6	2	1	1	
Calm	0	0	1	1	1	1	1	1	1	0	0	0	

Table 2. -- Mean Wind Speed (m.p.h.)

Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
20	19	16	13	11	10	9	10	13	20	22	22	15

From October through March there is a mean average of 20 days or more per month with a wind velocity greater than 22 m.p.h.

Table 3 -- Average Number Clear, Partly Cloudy and Cloudy Days

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Clear Day (0.00-0.19)	3	2	2	2	4	3	5	4	6	6	4	2	
Partly Cloudy (0.20-0.79)	9	9	10	14	15	16	19	18	17	15	13	12	
Cloudy (0.80-1.00)	19	17	19	14	12	11	7	9	7	10	13	17	

The amount of cloudiness is greater during the months of December through April than at any other time of the year. From July through October there is a mean monthly average of 4 to 6 clear and 15 to 19 partly cloudy days.

The mean relative humidity is rather uniform throughout the year. Fog is rare in this area but occurs most frequently during the months of March and April.

Table 4 -- Fog

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
No. Days	*	*	1	1	*	*	*	*	0	0	0	0	2

*Less than 1/2 day.

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Table 5. -- Mean Relative Humidity

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Ann
%	82	83	84	84	85	86	85	85	82	78	78	79	83

Winter is the dry season; summer is the wet. The rain fall during the wet season results from heavy showers which occur on less than 1/2 the days of each month. Typhoons may be expected between July and September.

In 33 years the lowest recorded temperature of Mako is 45° F. The maximum 93° F.

The diurnal temperature range is somewhat greater in winter than in summer.

Table 6. -- Temperature °F.

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Extreme Max	83	83	87	87	90	92	93	92	92	92	88	84	93
Extreme Min.	47	45	49	54	62	67	71	72	67	65	49	48	45

Summer is the most favorable season for low level bombing operations; autumn, for high level visual bombing operations. Summer is the season most favorable for chemical warfare operations. In general spring is also favorable for such operations but autumn or winter are not, due to frequent very strong winds.

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GENERAL . M .

GARAN-BI (GARAMBI)

Northeasterly and easterly winds predominate at Garanbi from October through March. Variable winds predominate during the summer months; the largest number of these variable winds are westerly and northwesterly. The winds during April, May and September are highly variable but with most of them northeasterly and easterly.

Table 1. -- Surface Wind Frequencies (%)

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
N	15	16	12	10	12	8	8	9	12	13	12	12	
NE	55	51	41	32	21	7	9	13	30	55	59	70	
E	17	17	22	27	21	17	22	18	27	20	13	11	
SE	2	3	6	8	7	10	13	10	7	3	1	1	
S	1	1	3	3	4	6	6	7	4	1	0	0	
SW	1	1	2	2	3	5	6	7	2	1	0	0	
W	1	2	3	4	9	21	13	14	4	1	1	1	
NW	5	7	8	10	16	20	17	16	7	3	2	3	
Calm	2	2	3	4	7	6	6	6	7	3	2	2	

Table 2. -- Mean Wind Speed (m.p.h.)

Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
12	11	11	8	7	7	7	7	7	11	14	14	10

During the months of November and December there is a mean average of over 20 days per month with wind velocities greater than 22 m.p.h.

The amount of cloudiness is much greater from May through September than at any other time of the year. October, November, December, January, and February have a mean monthly average of 4 to 5 clear and 17 to 21 partly cloudy days.

Table 3. -- Average Number Clear, Partly Cloudy and Cloudy Days.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Clear Day (0.00-0.19)	4	4	3	4	2	2	2	2	3	4	5	4	
Partly Cloudy (0.20-0.79)	19	18	21	19	19	17	18	15	19	19	17	18	
Cloudy (0.80-1.00)	8	6	7	7	10	11	11	14	8	8	8	9	

The mean relative humidity varies from 73% in December to 86% in August. In over 30 years there have been no days recorded with fog.

Table 4. Mean Relative Humidity (%)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
74	74	75	77	79	84	84	86	82	77	74	73	78

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Winter is the dry season at Garanbi; summer the wet. The rain falls during the summer season in rather heavy showers which occur on about half the days of each month.

Table 5. -- Precipitation

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct
No days with precipitation (0.004 in.)	13.0	12.2	11.2	9.6	12.7	14.2	17.3	16.6	16.3	15.1
Mean Precipitation (in.)	3.6	2.4	2.1	2.6	9.1	10.4	16.6	18.8	13.5	8.3

	Nov	Dec	Ann
No days with precipitation (0.004 in.)	13.1	13.7	165.0
Mean Precipitation (in.)	2.8	2.5	92.6

Freezing temperatures in this area are rare; the diurnal temperature range is rather uniform throughout the year.

Winter is the most favorable season for conducting high level visual bombing operations; autumn, for low level bombing. Spring is the most favorable for chemical warfare operations; in general, they can also be conducted effectively during the summer and the autumn.

During the winter, such operations may be limited by high winds.

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TAIHOKU—TANSUI

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TAIHOKU - TANSUI DISTRICT

Location: In northcentral Formosa, Latitude 25° 03' N, Longitude 121° 31' E.

Population: 340,114 (1939) of which approximately 90,000 are Japanese.

References:

a. Interim Report "Formosa" dated April 1944.

b. JANIS of Formosa, Vols. I, II, and III dated June 1944.

c. "Selected Aerial Objectives for Retaliatory Gas Attack on Japanese Controlled Mainland Installations" dated August 1944.

I. Importance

a. Taihoku is the capital and largest city in Formosa. It is the headquarters of both the military and civil administrations of Spratly Island and Hainan, as well as of Formosa and the Pescadores Islands. These administrative functions support many people, but the city has large and varied commercial interests, and is especially important as the packing and shipping center for most of the tea crop of northern Formosa. Industry is relatively less significant. Matsuyama, an industrial suburb of Taihoku, located about three miles to the east, is the site of Formosa's largest railroad shops as well as small factories and of the large Matsuyama Airport and air depot (including large maintenance facilities).

II. Terrain

a. Taihoku is situated on a low level area near the northern tip of the island at the junction of several tributaries of the Tansui-Ko, is on the east side of the Tansui River. To the north, between the Tansui and Kiirun Rivers and the sea, are mountains with altitudes exceeding 3,500 feet. Foothills of the main Formosan range lie five miles to the southeast. A belt of low, rolling hills separate Taihoku from the western coastal plain to the south and west. Soil in this area is clay; it is not trafficable except in dry weather. Valley floor is cultivated (rice and sugar cane) and slopes negligibly until the mountains are reached.

b. Taihoku comprises several distinctive districts of which "Jonai" is the governmental and Japanese residential section. The "Jonai" district, a rectangular area of some 3/4 by 1/2 miles, is distinctly outlined by a broad roadway and is the site of numerous government and military offices as well as clusters of Japanese houses. This district is surrounded on all sides by the "native city", the total area of which is about 3 1/2 by 2 miles (including the "Jonai" district). The city is unevenly built up, with congested residential districts broken up by school and hospital grounds to the NE and SE and by an open industrial section to the east. The largest barracks area is located just off the SE corner of the Jonai district. Other barracks are located west, north and east of the city and an Allied POW camp is located to the north.

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c. Taihoku is in the center of the Tansui-Taihoku-Keelung corridor. Access to the corridor may be across the beach southwest of the Tansui-Ka mouth, and through the narrow valley southeastward to Taihoku. Large scale operations are possible through this corridor. Near Taihoku, the Kiirun-Ka is about 200 yards wide and the Shinten-Kei is about 300 yards wide. Stream banks are steep and are about 20 feet high. Fording or bridging would be least difficult from November through January, and very difficult at other times. Existing bridges are built 20 to 30 feet above ordinary water levels to avoid being flooded. A shifting sand bar at the entrance to the Tansui-Ka has a depth of 6 feet at low level, but inside the bar the river is 9 to 12 feet deep and is navigable for light craft, nearly to Taihoku. The Tansui-Ko or the Shinten-Kei will have high water from June through August, and less water in November and December.

d. Taihoku is about 11 miles from the mouth of the Tansui River (Tansui-Ko). Landing beaches extend about 11 miles east of Tansui-ko but fringing barrier reefs about 100 feet wide parallel most of them; about 2 1/4 miles of beaches are suitable for landing operations. West of Tansui-Ko; the beach is excellent for landing operations and it extends to Hakushaton (approximately 23 miles). It is 100 feet or more in width, except between Kakoshi and Karyoshi, where it narrows to 50 feet or less. The beach is composed of gently sloping non-coral sand with little gravel or coarser material. Several suitable exits are available from the beaches on either side of Tansui-Ko.

III. Tactical Gas Targets*

Target No.	Name	Coordinates	Comment	Estimated Gas Target Area Square Yards
Taihoku Area (91.3)				
52	Matsuyama Airport	25° 04' N 121° 33' E	Aircraft assembly plant reported adjoining major airport**	1,300,000
28	Shinten River RR Bridge	25° 02' N 121° 29' E	Bridge on only RR connecting Keelung-Taihoku with S Formosa**	31,000
47	Jonai District of Taihoku	25° 03' N 121° 31' E	Civil and military administrative center; many public buildings**	990,000
Military Storage Area**				87,000
Barracks (Military)**				75,000
Landing Beaches***				1,555,000

*Limited to tactical targets only by JCS 825/3.
**To be a ttacked with HE then with persistent gas.
***To be attacked with persistent and nonpersistent gas.

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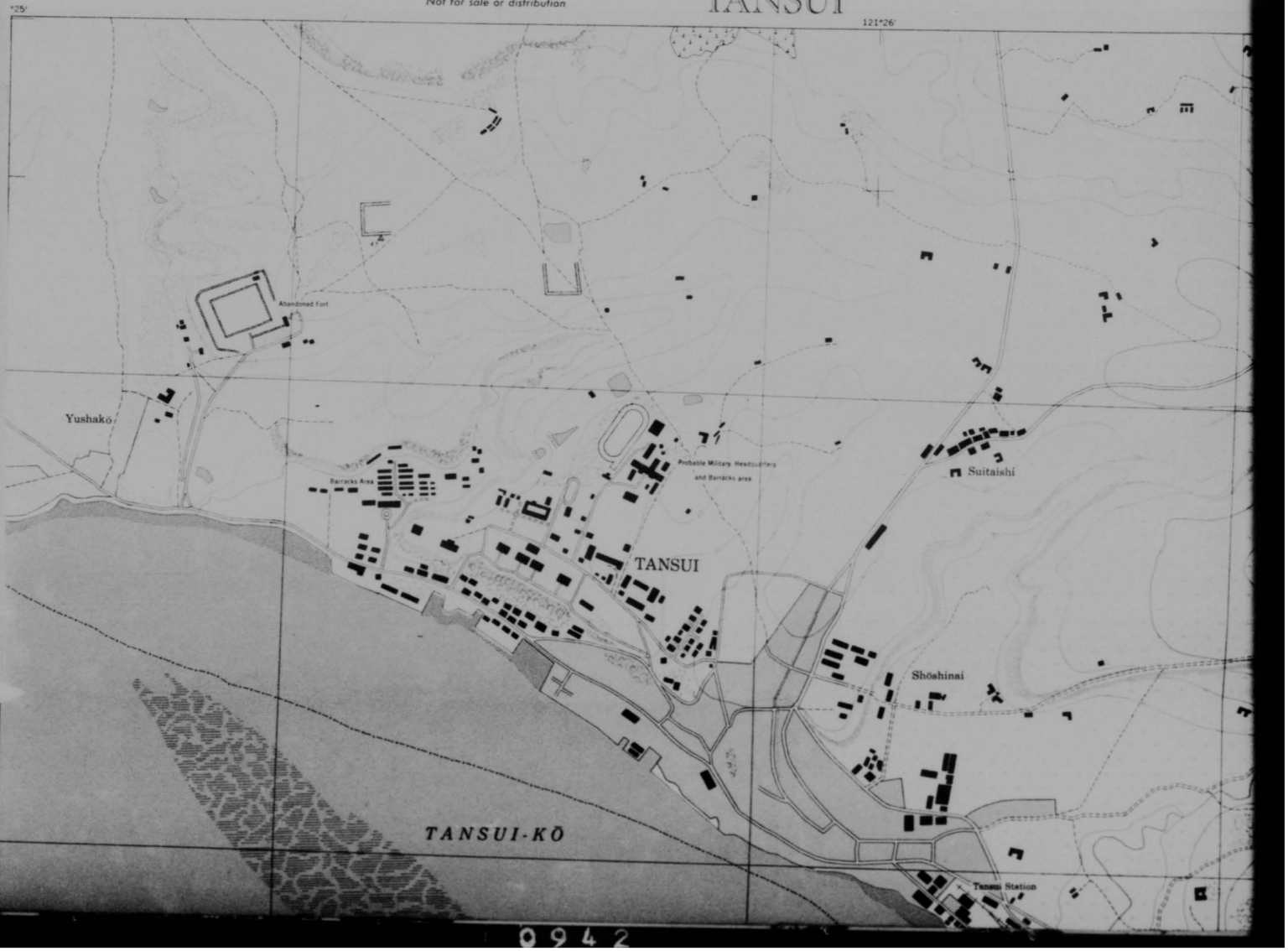
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FORMOSA CITY PLANS 1:8,000

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TANSUI

FIRST EDITION - AMS 1



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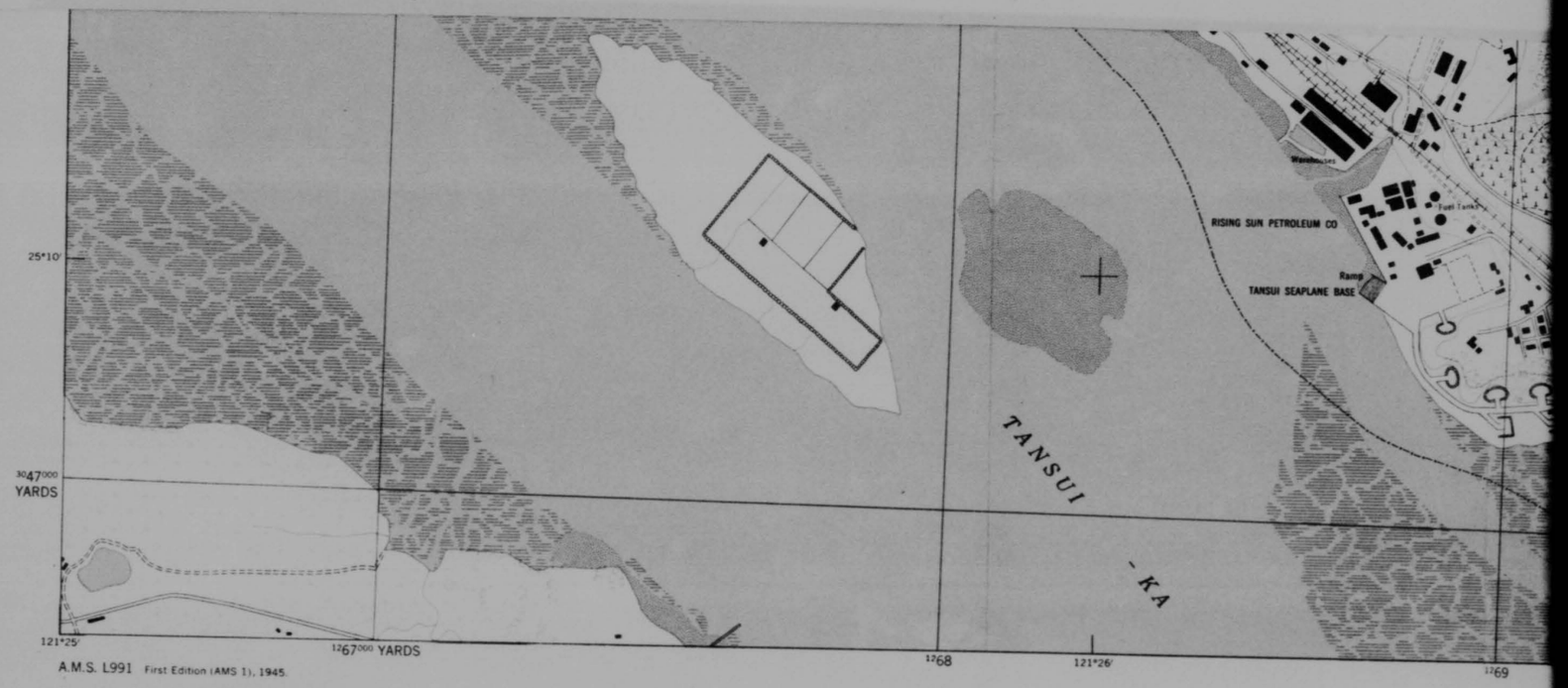


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A.M.S. L991 First Edition (AMS 1), 1945.

Prepared under the direction of the Chief of Engineers by the Army Map Service (AMS), U. S. Army, Washington, D. C., 1945. Compiled from aerial photography dated September 1944 by photo-planimetric method and by reference to Formosa 1: 50,000, Japanese Imperial Land Survey, Tansui, 1928; Tansui 1:18,400, G.S.G.S. No. 134, 1944; Formosa 1: 25,000, A.M.S. Sheet 2322-I SE, 1944. Additional information from intelligence data. Place names are transcribed according to the Modified Hepburn (Romaji) System.

Scale 1: 8,000

½ 0 ½ Mile

500 0 500 Meters

500 0 500 Yards

CONTOUR INTERVAL 10 METERS

POLYCONIC PROJECTION

ONE THOUSAND YARD WORLD POLYCONIC GRID, BAND IIIN, ZONE "D"
THE LAST THREE DIGITS OF THE GRID NUMBERS ARE OMITTED

NOTE: [illegible] USING THIS MAP WILL MAKE HEREIN CORRECTIONS AND ADDITIONS WHICH COME TO THEIR ATTENTION AND MAIL DIRECT TO THE CHIEF OF ENGINEERS, WASHINGTON, D. C.

INDEX

LEGEND

Areas densely built up
Areas moderately built up
National or Prefectural Road, generally metalled, over 4 m. wide
Road, 2-4 meters wide
Track or Trail
Railroads:
3'6" gauge, Single track with Station
3'6" gauge, Double track
Narrow, Light, or Special gauge, Single track
In street, labeled with gauge
Boundaries:
Prefectural (Chō or Shi)
Gun or Shi
Ku or Shō
Temple, Shrine, Pagoda
Church, Monument or Statue, Dam
School, Chimney
Prison, Radio mast, Mine
Ship Anchorage, Fence, Cemetery
Water wheel or mill, Mineral spring, Fumarole
Control point, Bench mark, Spot elevation .120
Generally Rice or Sugar Cane
Orchard or Vineyard, Bamboo
Mud or Tidal Flat
High tension line
Masonry retaining wall or Revetment, Falls

GLOSSARY

-gun	county	-kō	harbor
-ka	river	-chō	township
-kai	township	-shū	prefecture

3°00' E of N 53 MILS
1°02' E of N 18 MILS
MAGNETIC NORTH

APPROXIMATE MEAN DECLINATION 1944
FOR CENTER OF SHEET
ANNUAL MAGNETIC CHANGE 1' DECREASE

Use diagram only to obtain numerical values

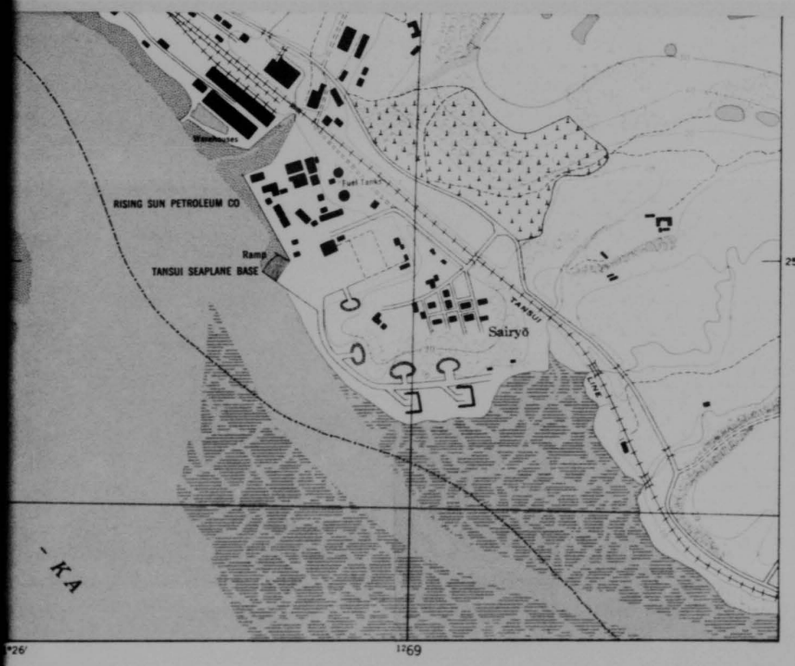
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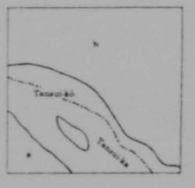
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ARMY MAP SERVICE, U.S. ARMY, WASHINGTON, D.C. 138912
1-45 1948

1 Mile
500 Meters
500 Yards

INDEX TO BOUNDARIES



Taihoku-shū
Tansui-gun
a Machiri-shō
b Tansui-kai

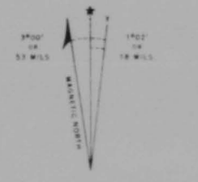
COVERAGE DIAGRAM



COMPILATION METHOD

PHOTO
PLANIMETRIC

1. Sortie 4MB/155 September, 1944, 24" L.V., RV



APPROXIMATE MEAN DECLINATION 1944
FOR CENTER OF SHEET
ANNUAL MAGNETIC CHANGE 1° DECREASE

Use diagram only to obtain numerical values

ZONE "D"

harbor
township
prefecture

TANSUI, FORMOSA (TAIWAN)
TAIHOKU-SHU

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TAKAO—HOZAN

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TAKAO - HOZAN

Location: On southwestern coast of Formosa. Latitude 22° 36' N, Longitude 120° 16' E. Hozan - Latitude 22° 37' N, Longitude 120° 23' E.

Population: 152,265 (1939) including 28,336 Japanese. Hozan - 19,837 (1935) including 831 Japanese.

References:

a. Interim Report "Formosa" dated April 1944, prepared by AC/AS Intelligence.

b. JANIS 87 "Formosa" (Vols. I, II, and III) dated June 1944.

c. Civil Affairs Handbook Taiwan (Formosa) Takao Province, OPNAV 13-22, Office, Chief of Naval Operations, Navy Department, 1 October 1944.

I. Importance

a. Takao is the second largest city in Formosa and is now probably the chief port of the island. Due to its strategic location it is a natural concentration point for traffic to and from Japan and the western and southwestern Pacific. It has, therefore, become a major military and naval base. In addition, Takao is the leading industrial area in Formosa. Industrial products include heavy machinery, aluminum, magnesium, alcohol, refined sugar, cement, fertilizers, and ships. This area contains two complete Naval Bases, (one at Toshien and one at Takao proper), two seaplane stations (one at Takao and one at Toshien) and one landing ground at Reigaryo. At Takao several repair facilities are located and a very large number of warehouses and large oil storage capacity. Hozan is important as a military storage area and a concentration point for troops to be embarked from Takao. Hozan is also the location of one of the most powerful radio transmitters in the Japanese Empire.

II. Terrain

a. Takao is situated near the southern end of the western lowlands. The city is built on flat land at the mouth of the Takao River (a small stream) and at the northern end of a narrow eight mile long lagoon. A sand spit completely encloses the lagoon except at the extreme northwest, where a channel less than 500 feet wide forms the entrance to Takao harbor. To the northwest of the city rises an isolated coral hill known as Takao-San or Ape Hill. This hill and particularly a 298 ft. high spur that projects southward from it commands the entrance to the harbor and separates Takao from the open sea. The rugged terrain of Ape Hill extends along the coast for about 3 1/2 miles and rises to a height of nearly 1200 feet. At its northern end are the harbor and town of Toshien. To the north, east, and south of Takao the terrain is flat and low and extensively cultivated. The southern end of the western foothills begin to rise about 8 miles to the northeast of the city while

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about 20 miles to the east the Central Mountain Barrier begins to rise. The soil to the northeast and east of Takao is fine clay while to the south of the city medium-textured loam appears. Generally the soils in Takao are suitable for cross-country movement, except in wet weather. The vegetation around Takao consists chiefly of cultivated fields (rice and sugar cane) and grassland with some bamboo planted around farm buildings. Ape hill is the only wooded area in the Vicinity of Takao.

b. The older portion of Takao is a compact area, roughly triangular in shape, with a projection at the southwest corner; it is bounded on the east by the river, on the south by the harbor, and on the west by Ape Hill. This is the main commercial section of the city, and also the chief Japanese residential district. The newer residential sections, mostly east of the river, are less compact. The city proper, which is characterized by a continuous network of closely spaced streets, does not extend more than 2 1/2 miles in any direction. Beyond this central core, there is a broad, outer zone in which are located most of the newly constructed industrial plants, military barracks, and storehouses of the area. The main concentration of industrial plants is on reclaimed land in the Reigaryo area, about 2 miles southeast of the center of Takao.

Takao has been well laid out on a rectangular pattern, with numerous secondary fire breaks, but it lacks the broad diagonal avenues built by the Japanese in other Formosan cities. Some main streets are 45 feet or more in width and are paved; less important ones are perhaps half as wide and have improved surfaces.

Takao is accessible by the west coast railroad, the west coast highway and by the sea.

Within a radius of 5 miles of the center of Takao there are more than 500 barrack-type buildings and military quarters and others appear to be under construction.

There are landing beaches extending about 15 miles from Ape Hill to the north side of the Ka-tansui-Kei. The only break in the beach is the harbor entrance at Takao. The bottom slopes imperceptibly to the beach, with 30 foot depths about a mile offshore. The mean range of the tides is 1.2 feet; waves approach the shore directly from the south and southwest during the summer season; in winter the area is relatively sheltered from the southward moving waves along the west coast of Formosa.

The main beach bordering the shore of the Takao area for 15 miles southward from the town narrows from 200 to 100 feet in this northern half, then narrows rapidly so that the southern half is generally 15 - 20 feet wide. It is composed of uniform grained sand and in its wider portions is backed by low dunes. The foreshore area is firm with a moderate slope, while the backshore is soft and gently sloping. The north half is backed by a lagoon 7 1/2 miles long; the lagoon outlet at the north end forms the entrance to Takao harbor. South of the lagoon a swampy area lies directly behind the beach. A rocky point crosses the beach 5 miles from the south end. The surf is generally moderate, with 2 or 3 lines of breakers parallel to the shore line. The beach, 0.3 mile long north of the Takao harbor entrance, is used for bathing.

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A broad, intensively cultivated plain, with a few scattered hills, lies back of the beach area. A trail runs along the spit that forms the coast along the north half of the area; the east side of the spit, along the lagoon shore, is thickly built up. Southeast of the lagoon an improved road loops close to the shore, lying near and parallel to the beach between the villages of Dairinho and Kako. Southeastward an unimproved road runs inland from small villages on the beach.

III. Gas Targets*

Target No.	Name	Coordinates	Comment	Estimated Gas Target Area Square Yards
	Barracks**		These barracks are at 5 different locations in the Takao Hozan Area.	317,940
179	Hozan**	22° 37' N 120° 21' E	Large military camp. Probably a staging area.	1,626,700
8a	Military Storehouses & main wharf (Takao)**	22° 37' N 120° 17' E	Complete wharfage and warehouse facilities. Most buildings are sheet metal over steel frame; a few are wood or concrete	504,450
176	Reigaryo Military Stores (Takao)**	22° 36' N 120° 19' E	Three groups of military supply warehouses and munitions stores; over 230 buildings.	1,154,450
	Military Supply Depots**		7 military supply installations scattered throughout the Takao, Toshien, Hozan Area.	2,156,700
8b	Takao River Wharves**	22° 37' N 120° 19' E	7 warehouses and 200 ft. of wharf included in area.	203,900
7	Kigo Naval Dockyard (Takao)**	22° 37' N 120° 16' E	Former Naval dockyard, now probably building patrol vessels. May still be utilized as a naval establishment.	466,670

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Target No.	Name	Coordinates	Comment	Estimated Gas Target Area Square Yards
175	Reigaryo Shipyard (Takao)**	22° 37' N 120° 18' E	New shipyard, with 8 ship ways, probably builds standardized cargo vessels. Probably includes Marine engine works.	215,450
56	Toshien Dockyard (Toshien)	22° 41' N 120° 16' E	Naval dockyard under construction.	190,000
	Gun Positions **		5 gun positions scattered throughout Takao Hozan district.	229,000
	Reigaryo Seaplane Station ***(Takao)		Buildings & Installations only.	2,920
	Reigaryo Landing Ground (Takao) ***	22° 35' N 120° 21' E	Buildings & Installations only.	123,000

*Limited to tactical targets only by JCS 825/3.
**To be attacked with HE then with persistent gas.
***To be attacked with either nonpersistent or persistent gas.

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TAKAO
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DATE OF PHOTOGRAPHY 20 DEC. 1943
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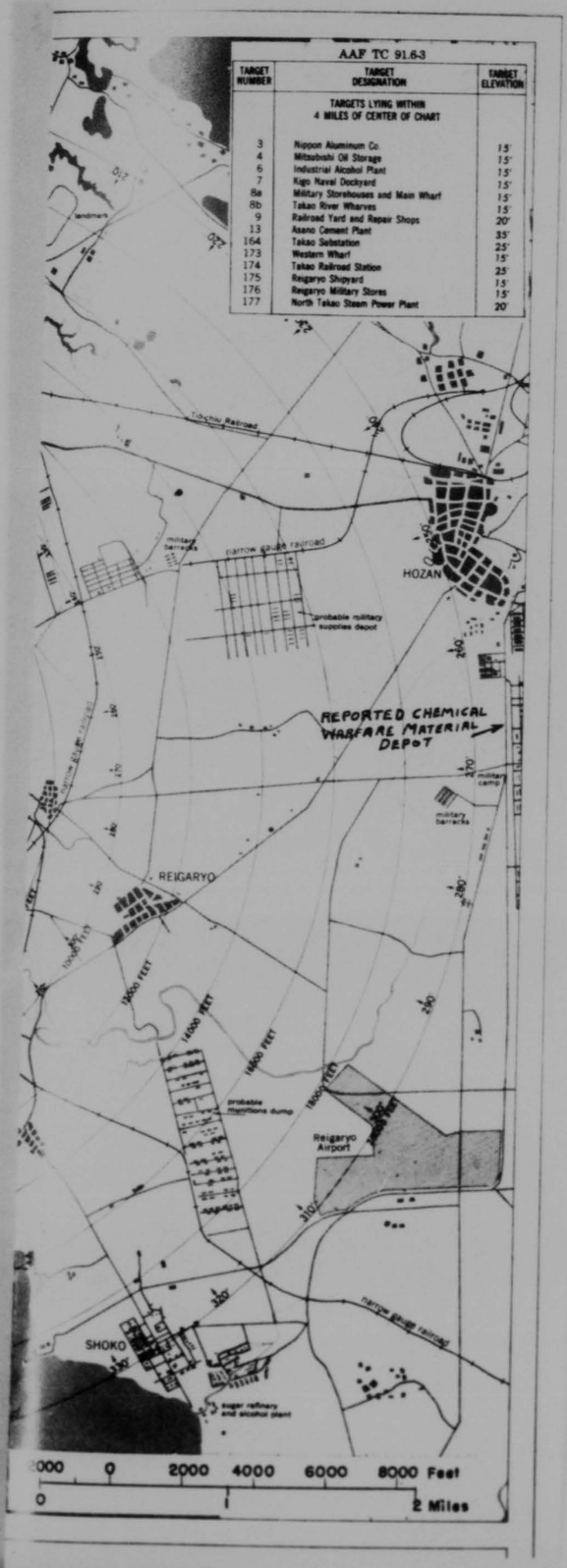
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TAINAN

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TAINAN

Locality: On southwestern coast of Formosa. Latitude 23° 00' N, Longitude 120° 12' E.

Population (1939): 142,133 of which 16,653 are Japanese

References:

a. Interim Report "Formosa", dated April 1944, prepared by AC/AS Intelligence.

b. JANIS 87 "Formosa" dated June 1944

c. Civil Affairs Handbook, Tainan (Formosa), OPNAV 50 E-12, Office of the Chief of Naval Operations, Navy Department, dated 12 June 1944.

I. Importance

a. Tainan is the third largest city in Formosa and the seat of the Tainan provincial government. The city is noted for its schools and commercial houses, but has fewer industries than most cities of comparable size. It is an important military center with an extensive barracks development and two airfields. The town of Ampin, which is the port for Tainan, is located 2 1/2 miles west of the city. The port is only satisfactory for small shallow draft vessels. Industrial installations include a salt works, a magnesium factory, a sugar refinery, and an alcohol plant.

II. Terrain

a. Tainan is in the southern part of the western coastal plain, 2 miles inland from Formosa Strait, and about 25 miles north of Takao. This region is a flat and poorly drained plain. To the north, east, and south of the city the plain is highly cultivated (rice and sugar cane) while to the west are found swamps and tidal flats. This flat plain extends many miles to the north and south of Tainan. Foothills begin to rise about 10 miles to the east of the city. The soil in this area consisting of clays and gravel, is only trafficable during dry weather.

b. Tainan is an irregularly shaped city, 2 to 2 1/2 miles across in any direction. The principle streets form a generally rectangular plan except in the central area, where a wheel pattern predominates. Secondary streets make an irregular pattern.

c. The central portion of the city is compact, but the margins contain open areas.

d. Most of the Japanese part of the town is located on a broad, well joined avenue connecting the railroad station and the central circle. The principle streets of Tainan are wide, well graded all weather roads capable of sustaining heavy traffic. Some of them are paved.

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e. Tainan is served by the trunk line of the Taihoku to Takao railroad and by the west coast highway of Formosa.

f. There are landing beaches extending from the Sobun-Kei 33 miles south to Takao. The beaches are composed of sand and generally firm. The beach slope is moderate in the foreshore and becomes gentle in the back shore to the foot of the dunes. There are no barrier reefs and the moderate surf breaks directly and parallel to the beach. The beach has a fairly uniform width of 100 feet or more. A sand dune belt, wooded in places, lies behind the beach for a width of 100 to 450 feet. The beach is interrupted by three lagoon outlets at and north of Tainan and by four stream mouths south of Tainan.

III. Gas Targets*

Target No.	Name	Coordinates	Comments	Estimated Gas Target Area - Sq.Yds.
112	Tainan Barracks**	23° 00' N 120° 12' E	Barracks are scattered through city; permanent tactical installations	150,000
	Emansho Airport**	22° 58' N 120° 12' E	Estimated area for gas attack occupied by maintenance & communication installations.	880,000
	Landing Beaches***			16 1/2 sq. mi.

* Limited to tactical targets only by JCS 825/3
**To be attacked with HE then persistent gas
***To be attacked with either nonpersistent or persistent gas.

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PROVISIONAL EDITION

TOWN PLAN OF T

IDENTIFIED BUILDING
IDENTIFIED BUILDING (LOCATION APPROXIMATE)
BUILT-UP AREA
PARK AREA
ATHLETIC FIELD
ARMY BARRACKS AREA
RAILROAD - 3'6" GAUGE

0 250 500 1000 YARDS
0 250 500 1000 METERS

BASE MAP 1926, PARTIALLY CORRECTED WITH AERIAL PHOTOGRAPHS NOV 1943
Reliability Code: 2B-2B-2

120°11'30"

To Kori

FORMOSA (TAIWAN)

120° 121° 122°
25° 24° 23° 22°
Tainan
MILES
KILOMETERS

23° 00' 00"

Hospital
Small Boat Yard
School
To Ampin
TAINAN CANAL
Area
Warehouse
N

TOWN PLAN OF AMPIN

(SCALE UNKNOWN)

22° 59' 30"
120°11'30"
Hospital
Monopoly Factory
Salt Refinery
Mitsui Company
School
School
Textile Pla
N
AMPIN - TAINAN
MILES
KILOMETERS
Canal
TAINAN
TAINAN CANAL
SAME BASE MAP AS TAINAN

NO. 3333
24 MAY 1944

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AINAN

120°12'00"
120°12'30"
23° 00' 30"
23° 00' 00"
22° 59' 30"

To Kagi and Saiko

School
Tainan Park
Army Headquarters
Hospital
School
Turntable
School
Monopoly Office
School
Hall
Hall
Water Supply Office
Bank
Railroad Station
Railroad Yards
Munitions Storage
Hospital
Bank
Hall
Railroad Repair Shops
Bank
Newspaper Bldg.
Blind Asylum
School
West Market
Old Hotel
Post Office
Military Police Headquarters
Governor's Residence
Provincial Government Office
Museum
Shrine
School
Hall
School
Court of Justice
School
School
Shrine
Hospital
Prison
Electricity and Water Supply Office
Radio Station
To Kambyō
School
School
School
School
Coastal Road
To Takao

120°12'00"
120°12'30"

CONFIDENTIAL

COMPILED AND DRAWN IN THE BRANCH OF RESEARCH AND ANALYSIS, OSS
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KEELUNG

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KEELUNG - (KIIRUNG) FORMOSA

Location: Latitude 25° 08' N, Longitude 121° 44' E. Northeast coast of Formosa.

Population: 1939 - 100,511 including 24,815 Japanese.

References:

a. Interim Report "Formosa" dated April 1944, prepared by AC/AS Intelligence.

b. JANIS of Formosa, Vols. I, II and III, dated June 1944.

c. "Selected Aerial Objectives for Retaliatory Gas Attack on Japanese Controlled Mainland Installations" dated August 1944.

I. Importance

a. Keelung, the fourth largest city in Formosa, is a leading port and the northern gateway not only to Formosa, but to most of the Japanese controlled territory in South China and Southeastern Asia. It is the center of a highly developed military and naval zone, and its port facilities are being steadily improved. The district surrounding it is an important industrial area, and also contains valuable coal mines. Keelung is the northern terminus of the chief railroad on the island.

II. Terrain

a. The city of Keelung is in the temperate zone; it is situated on a narrow beach shelf at the south end of the harbor. Rolling, wooded hills reaching an elevation of 300-600 feet, surround the city and harbor and permit easy passage only along the narrow beach or through a steep narrow valley west of the city. The harbor is a long, narrow dredged basin, originally a small estuary. Soils in this area are predominantly medium textured loams (clays in paddy land areas); it is trafficable except during and immediately after precipitation (paddy land clays non-trafficable except when dry). Rice cultivation predominates in low land around the city; leaves are usually green; crops are in all stages of growth throughout the year.

b. The city proper occupies a very small "L" shaped site along the south and southeast sides of the harbor; it covers an area of about 1/2 by 1 mile and averages about 1/2 mile in width; it is congested with one and two story houses and has few large buildings (which are located near the waterfront). A small built-up area, about 3/4 x 1/4 miles, projects eastward from

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the southeast end of the harbor area. The main barracks area is located at the foot of a hill, directly south of the city proper. Extensive wharves and warehouses line the western sides of the harbor, in two groups separated by an inlet. They cover an area of some 1 x 1/4 miles. The shipyards are located at the west and northeast ends of the harbor; electro-chemical plants are located to the northwest of the city.

c. A corridor, extending from Keelung to Taihoku, (approximately 17 miles) is nearly flat and mostly planted to rice (terraced). The corridor is from 3 to 7 miles wide and commanded on each side by steep-sided, tree-covered hills from 500 to 2,000 feet in height. About two miles south of Keelung there is a forested ridge less than 300 feet high; it is the roughest, steepest and narrowest part of the corridor, having a width of less than a mile for suitable operations. All drinking water should be purified. Fording or bridging the Kiirun-Ka would be least difficult from November through January and very difficult at other times. Existing bridges are built 20 to 30 feet above ordinary water levels to avoid being flooded. Near Taihoku, this corridor is joined with the Tamsui-Taihoku corridor. Through these two would be the best approach to attacking Keelung and the control of these corridors would dominate the northern coast of Formosa.

d. A good all weather highway connects Taihoku and Keelung. Keelung has no airfield but is serviced by the one at Taihoku.

III. Tactical Gas Targets*

a. To be attacked with persistent gas.

Target Number	Name	Sq. Yds.	Approximate Coordinates	Significance and Description
15a	NW Keelung Wharves**	242,000	25° 09' N 121° 44' E	Probable military storage, 5-7 three story concrete warehouses with fixed cranes on roofs. Ten 3-ton cranes on wharves.

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Target No.	Name	Sq. Yds.	Approximate Coordinates	Significance and Description
15b	SW Keelung Wharves**	217,000	25° 08' N 121° 44' E	General cargo wharves for RR trans-shipment 6 concrete warehouses and several storage sheds. Keelung RR Station & Yards, small repair shops at S end. Several heavy duty cranes. Small factory district near RR Station.
	Gun Positions	156,000		Anti-aircraft and coastal.

b. To be attacked with either persistent or nonpersistent gas.

Barracks and prepared Infantry positions	240,000		Permanent tactical installations.
Taihoku-Keelung Corridor	7,750,000		Estimated area attacked with gas munitions during operations

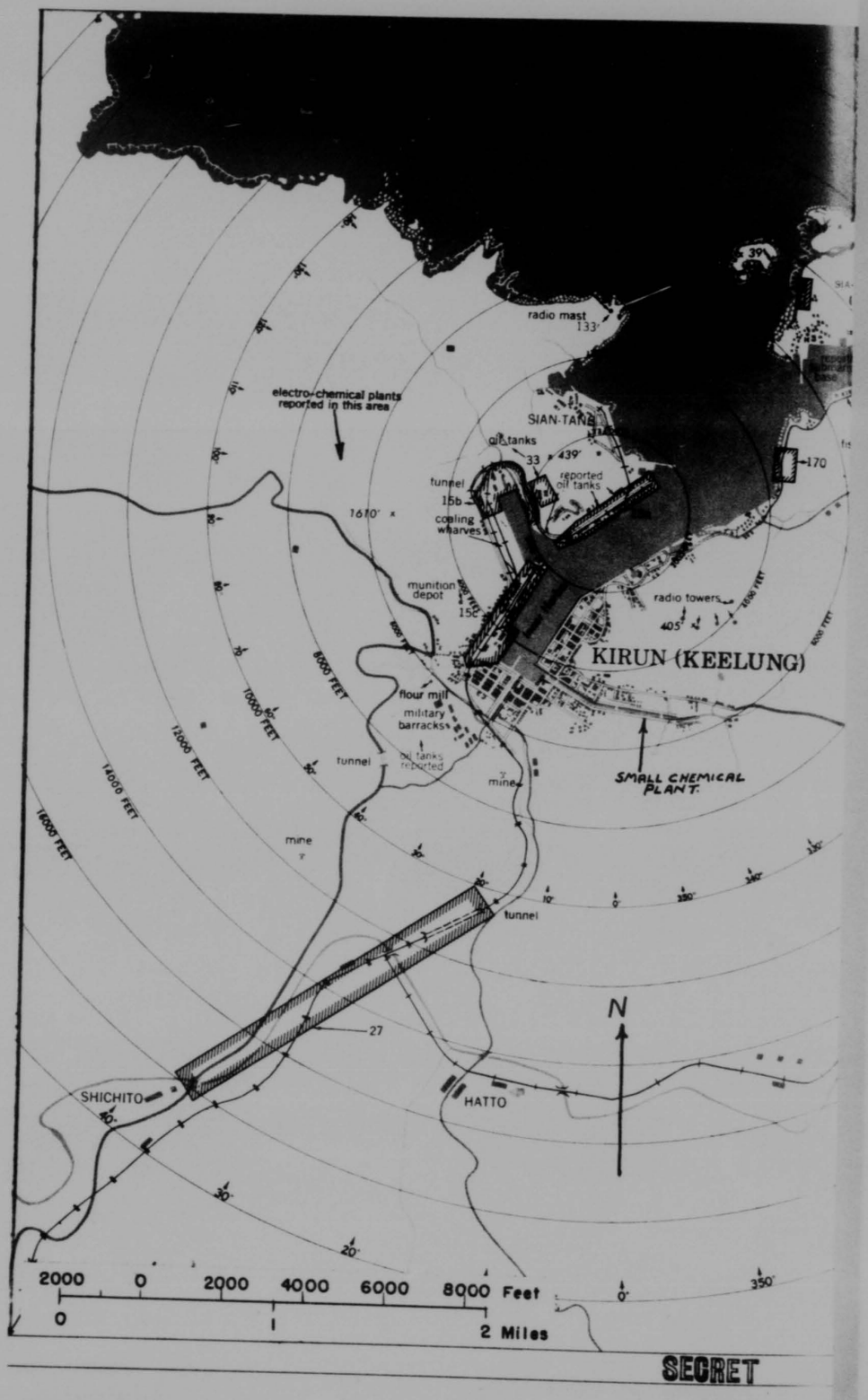
* Limited to tactical targets only by JCS 825/3.
** It is assumed that all buildings, bridges, etc., will be attacked with HE and then with persistent gas.

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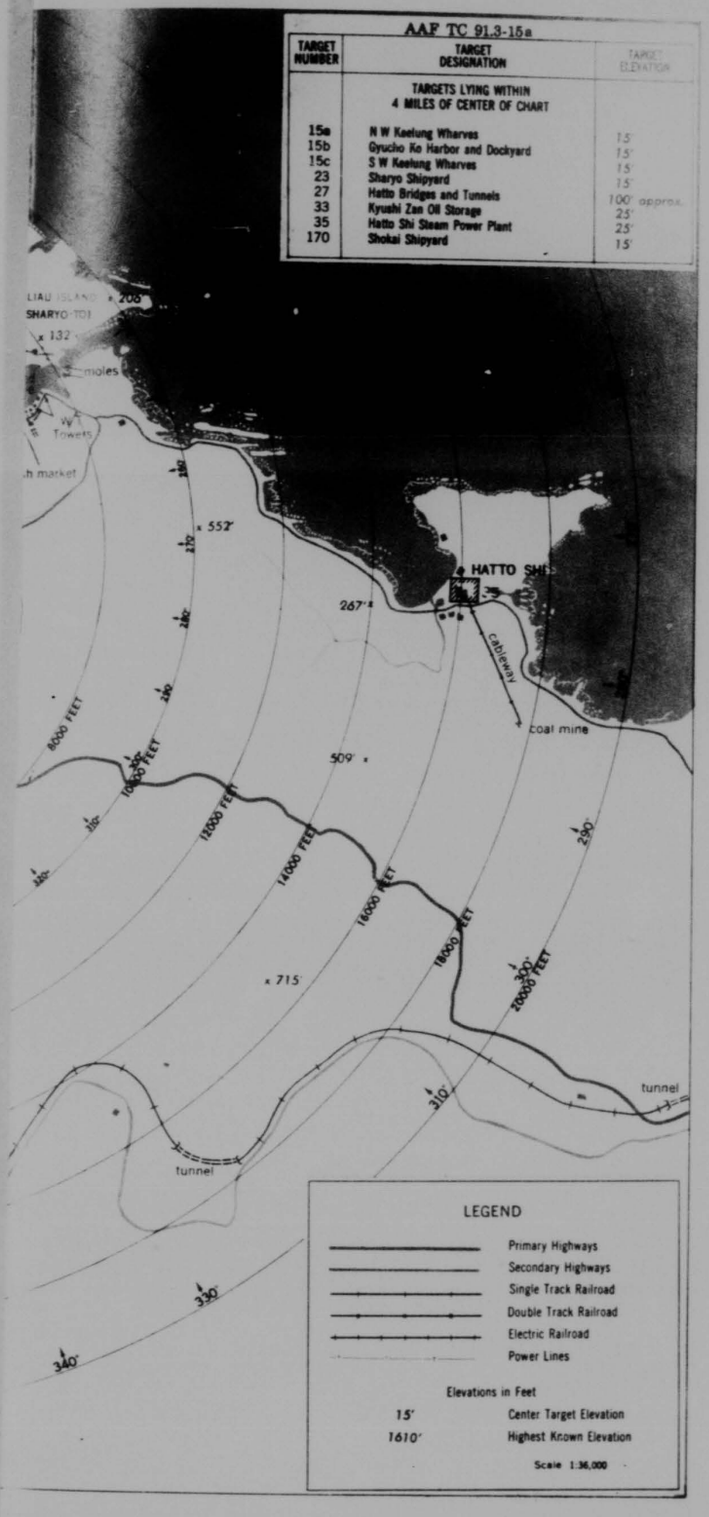
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TARGET NUMBER	TARGET DESIGNATION	TARGET ELEVATION
	TARGETS LYING WITHIN 4 MILES OF CENTER OF CHART	
15a	N W Keelung Wharves	15'
15b	Gyucho Ko Harbor and Dockyard	15'
15c	S W Keelung Wharves	15'
23	Sharyo Shipyard	15'
27	Hatto Bridges and Tunnels	100' approx.
33	Kyushi Zan Oil Storage	25'
35	Hatto Shi Steam Power Plant	25'
170	Shokai Shipyard	15'



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KAGI

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KAGI

Location: Kagi is about 130 miles south-southwest of Taihoku. Latitude, 23° 29' N, Longitude, 120° 27' E.

Population (1939): 92,428, including 9,960 Japanese.

References:

a. Interim Report "Formosa", dated April 1944.

b. JANIS of Formosa, Vols. I, II and III dated June 1944.

c. "Selected Aerial Objectives for Retaliatory Gas Attack on Japanese Controlled Mainland Installations" dated August 1944.

d. "Formosa" pages 3329 - 3341 inclusive, Vol. III No. 42 (dated 18 October 44), Office Naval Intelligence Weekly.

e. Strategic Engineering Study No. 100, Summary Formosa (Taiwan) Terrain Intelligence, Office, Chief of Engineers, U.S. Army, dated July 1944.

I. Importance

a. Kagi is the fifth largest city in Formosa and is an important market for lumber from the Ari-San district in the mountains and is a center for the distribution of alcohol from sugar cane and sweet potatoes in the surrounding area. It has one of the most important airfields in Formosa. Before 1941, large scale maneuvers were held periodically near Kagi. Major troop concentrations of troops are believed to be in this area.

II. Terrain

a. Kagi is 18 miles from Formosa Strait and is 7 miles from the foothills of the central mountain range; it is on a comparatively broad stretch of the western coastal plain. It lies between two streams, the Bakushi-Kei on the north and the Hassho-Kei on the south; it is commanded by the low rugged hills on the east. It is a hub for secondary railways and roads and is on the main west coast road and railroad. Rice and sugar cane are grown on the country on all except the eastern side of the city; bamboo clusters surround the farm buildings. To the east there is a narrow belt of grassland which merges into a broad leaf forest of camphor, oak, fig, bamboo palms, banyan, and cork trees. There are scattered clumps of trees along the river banks. Medium textured alluvial (loams; clays in paddy land areas) soils predominate but to the east there is some fine textured (clay and stony clay) soils developed on gravels of terraces and table lands, and

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some thin stony soils of foothills and other rough terrain generally below 1600 feet. The thin stony soils are generally non-trafficable regardless of weather or soil conditions; the other soils are trafficable except during and immediately after precipitation.

b. Kagi is shaped like a right triangle, with an east-west long side, a north-south short side and northeast-southwest hypotenuse marked by railroad lines; this built-up area has an area of approximately 1-5/8 square miles. A first-class military airfield, located three miles to the southwest, is reached by connections with the main railroad and highway. This airfield has extensive maintenance and repair facilities.

c. Two miles north of the city, the west-coast main highway crosses the Bokushi-Kei, about 150 yards wide. Thirteen miles further north, the route crosses the Hokko-Kei, about 100 yards wide. Seven miles southwest of the city, the route crosses the Hassho-Kei. Low rugged hills to the east command the road through this region. East-west movement across this region tends to be parallel to, but at a distance from, the streams (which generally flow westward). These streams have low but steep banks; the bottoms are generally flat; stream flows vary greatly, from a trickle in winter, to a flood in summer. Currents are swift. Fording or bridging operations would be difficult; by-passing them would likewise be difficult.

III. Gas Targets*

AAF Target Number	Name	Approximate Location	Significance and Description	Estimated Area Sq. Yards
	Barracks**	23° 29' N 120° 27' E	Permanent barracks at military camp	20,000
	Airfield**	23° 28' N 120° 23' E	Includes shops and warehouses	410,000

* Limited to tactical targets only by JCS 825/3.
** To be attacked with HE then with persistent gas.

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PROVISIONAL EDITION

TOWN PLAN OF KAGI

3'6" GAUGE RAILROAD

2'6" GAUGE RAILROAD

IMPORTANT BUILDING

GROUP OF IMPORTANT BUILDINGS

Approximate Scale

100 0 100 200 300 400 500 600 700

YARDS

100 0 100 200 300 400 500 600 700

METERS

Reliability Code: 2B-2B-2

Kagi Timber C

Timber Co.

Ice Plant

Waterways Office

Mayor's House

Timber Company

Inspection Office

Railroad Workers' Houses

Hospital

Church

Hospital

Police

Kagi Assembly Hall

Kindergarten

Trust Bank

Bank

Fire Station

Hospital

Hotel Aoyanagi

Station Master's Office

Railroad Station

Yards

Railroad

West Market

Post Office

Hotel

To Bokushi

Iken Ironworks

Ice Plant

Brick Company

Hospital (Women)

Girls' School

Nakahayasi Ironworks

Monopoly Bureau

Round House

Toyo Concrete Company

To Tainan

Hotel

Hospital

Electric Light Company

Transformer Station

To Tainan

Police Station

School

Factory

Girls' High School

School

Butanol Plar

NO. 3358

19 MAY 1944

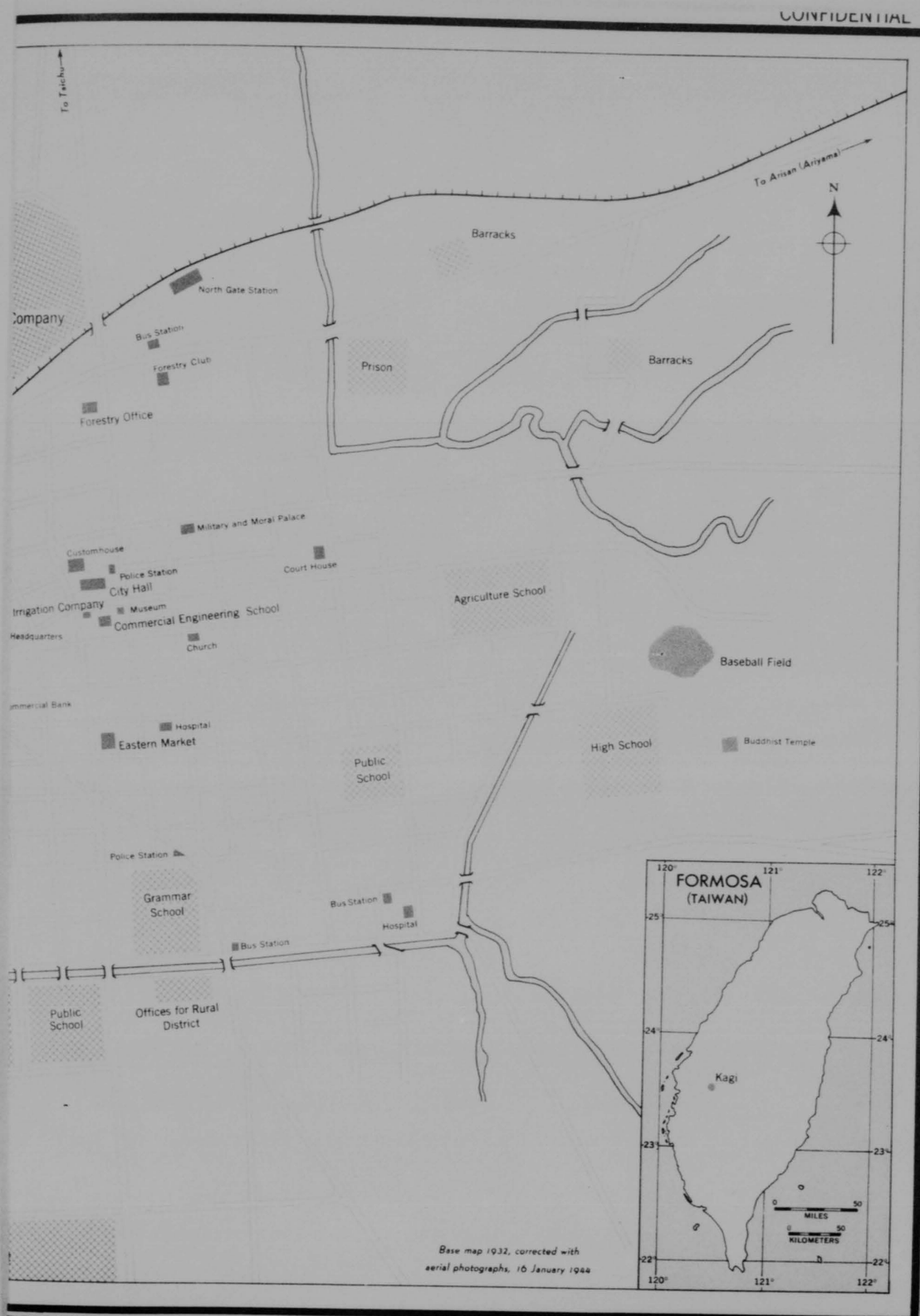
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TAICHU

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TAICHU

Location: Taichu is in the central part of the western coastal plain some 85 miles southwest of Taihoku. Latitude 24° 09' N, Longitude 120° 10' E.

Population(1940): 82,259, including 16,300 Japanese

References:

a. Interim Report "Formosa", dated April 1944.

b. JANIS of Formosa, Vols. I, II, and III, dated June 1944.

c. "Selected Aerial Objectives for Retaliatory Gas Attack on Japanese Controlled Mainland Installations" dated August 1944.

d. Civil Affairs Handbook, Taiwan (Formosa), Taichu Province, OPNAV 13-26 Office Chief, Naval Operations, dated 15 October 1944.

I. Importance

a. Taichu is the sixth largest city in Formosa. It is the center of a rich agricultural district producing rice, sugar, fruits, jute, and hemp, and has a large plant for refining sugar and distilling alcohol. Two airfields (with extensive maintenance and repair facilities) are located several miles to the northwest, and several groups of military buildings are in or near the city.

II. Terrain

a. Taichu is about 12 miles inland and 4 miles from the foothills of the central mountain range; it is in the center of a fertile plain which is virtually enclosed by the Chuo Mountain range to the east and the lower, coastal range (Daito) on the west and southwest. It is a hub for secondary railways and roads and it is located on the main west coast road and railroad. The Yanagi-gawa, boring through the northwest part of the city, and the Midori-gawa, through the southeast section drain southeastward to the Daito-Kei. Rice and sugar cane (during the dry season) are grown on the surrounding nearly flat plain; there are many scattered clumps of trees; grassy areas are about three miles eastward. Medium textured alluvial (loam - clays in paddy land areas) soil predominates; eastward from the city to the foothills is some fine textured clay and sand; in the foothills, the soil is thin and stony or of other rough terrain generally below 1600 feet. These soils are trafficable except during and immediately after precipitation.

b. Taichu is roughly circular in shape, with a diameter of about 1 1/2 miles. There are two grids of straight streets intersecting at right angles. The smaller grid lies southeast of and parallel to the main railroad; the larger, northwest of the railroad, meets it at an angle. The southeast section is the manufacturing section; the area northwest of the railroad, reaching as far as the Yanagi-gawa, is the real center of the city. In the eastern outskirts of the city is a large military

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post. The Taichu and Toyohara airfields are 2 and 7 miles, respectively, north-northwest of Taichu; each has hangars, barracks, warehouses, maintenance and repair shops and administrative areas.

c. A north-south ridge (Chuo Mountains) west of Taichu, between Taiko-Kei and Daito-Kei, rises to about 1,000 feet, and would divert north-south movement to lower areas on either side. The west coast main highway divides around this ridge; one part passes through the corridor about 7 - 10 miles wide) to the east and in this corridor Taichu and Toyohara are located. The ridge commands this corridor through which all north-south routes pass. East-west movement across this region tends to be parallel to, but at a distance from streams (which generally flow westward). The Daito-Kei near Taichu and westward has low but steep and wide banks; the bottom is, generally, flat and subject to flooding particularly from May through September; the current is swift. Fording or bridging operations would be difficult; by-passing would be difficult. This stream is not generally navigable; short stretches near the mouth are navigable for native craft at high tide.

d. Landing beaches with good exits are approximately 2 miles southwest, west and northwest of the city.

III. Gas Targets*

Target No.	Name	Approximate Location	Significance and Description	Estimated Area Sq. Yds.
	Barracks**	24° 09' N 120° 10' E	Permanent Barracks at Military Camp.	70,000
	Warehouses **	24° 09' N 120° 10' E	Military Supply Depots	10,000
	Airdrome Taichu**	24° 11' N 120° 39' E	Air base with six hangars and several maintenance and repair shops	100,000
	Airdrome Toyohara**	24° 15' N 120° 38' E	Air base with eight hangars, 3 maintenance and repair shops, 2 storage tanks, 25 feet diameter and 11 store buildings.	300,000
	Landing Beaches***	Approximately 2 - 3 miles southwest, west and northwest of the city.		3 sq. miles.

*Limited to tactical targets only by JCS 825/3.
**To be attacked with HE then with persistent gas.
***To be attacked with either nonpersistent or persistent gas.

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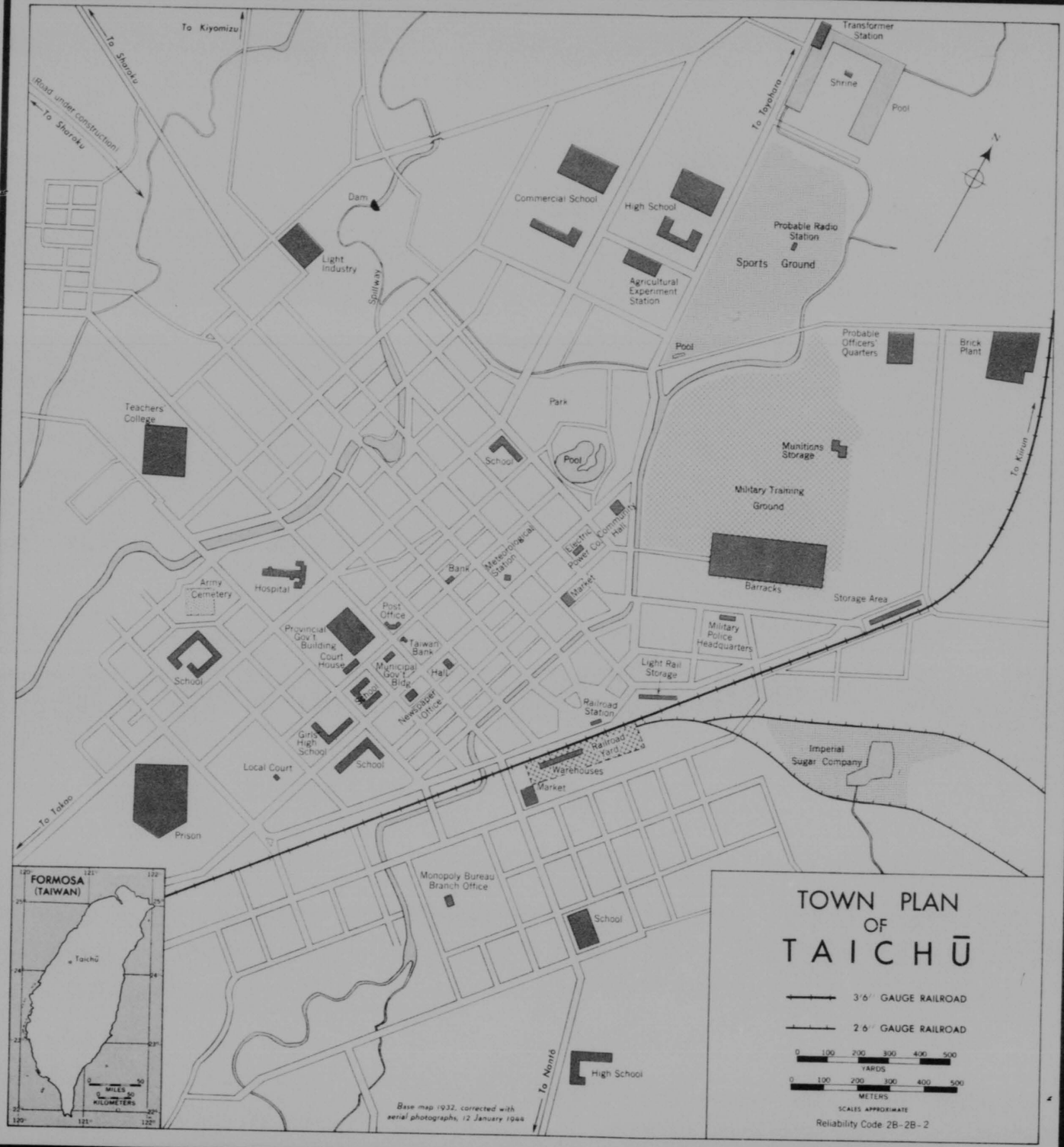
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NO. 3357
20 MAY 1944

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SHINCHIKU

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SHINCHIKU

Location: Shinchiku is 38 miles west-southwest of Taihoku and 3 miles inland from Formosa Strait. Latitude 24° 48' N, Longitude 120° 57' E.

Population (1940): 57,957 including 7,504 Japanese

References:

a. Interim Report "Formosa", dated April 1944.

b. JANIS of Formosa, Vols. I, II and III, dated June 1944.

c. "Selected Aerial Objectives for Retaliatory Gas Attack on Japanese Controlled Mainland Installations" dated August 1944.

I. Importance

Shinchiku is the seventh largest city in Formosa and it is the capital of Shinchiku Province. Its economic importance is based largely on rice, sugar, and tea, especially oolong, produced in the surrounding area. Southwest of the city, the trunk railroad and main highway of the island approach a section of the coast where there are good landing beaches. A large military airfield equipped with important maintenance and repair facilities has been developed on the northwestern outskirts of the city; it is also a combination staging base and bomber training school.

II. Terrain.

a. Shinchiku is built in the center of a triangular coastal plain south of the Hozan-Tozen river channels. The town is said to have been a port for junks but recent photographs indicate no port facilities and no evidence of water borne traffic other than a few sampans. The narrow guage trunk railroad and the main highway pass through Shinchiku. Rice is grown on the lowlands. Surrounding the town (except on the east), medium textured alluvial (loam-clays in paddy land areas) soils predominate. Loams are trafficable except during and immediately after precipitation. East of town are grown sugar cane, vegetables, sweet potatoes, and tea, especially oolong; the soil is predominantly course textured alluvial (sandy and gravelly) soils which are trafficable except during heavy precipitation.

b. The built-up area is roughly square in shape, each side being approximately 2,000 yards. The old Chinese town of narrow crooked streets has been modified greatly by the construction of several wide, regular streets.

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The town is divided by a straightened stream channel. In the northwest outskirts of the city is one of the largest airfields in Formosa. Shinchiku is also the site of other army camps. Narrow guage railroads and secondary roads communicate with small towns and villages nearby.

c. Three miles southwest of Shinchiku, the main west coast roads turns northeastward across rice fields and numerous small streams. Directly northeast of Shinchiku, the many channels of the Tozen-Kei and the Hozan-Kei comprise a four mile long, nearly continuous obstacle. Five miles northeast of Shinchiku, the road follows the inland, better drained edge of the wet coastal plain to Chureki, Daikei and Toen. Easy movement south of Shinchiku will be confined to the narrow coastal belt which is a defensive phase line. Operations both north and south of the town will be hindered by the numerous ponds, the rivers (with low, steep banks), ditches, and the wet, low ground.

d. The streams in this area have flat bottoms, covered with pebbles and probably brick red in color. The currents are swift. Fording or bridging would be easiest from October to February and most difficult from March through September. These streams are not navigable. By-passing either ponds or streams would be difficult.

III. Tactical Gas Targets**

AAF Target No.	Name	Approximate Location	Significance and Description	Area Sq. Yards
	Airdrome**	25° 50' N 125° 55' E	Eight hangars and over 30 shops and stores buildings - staging area and training school; first class base	1,000,000
	Barracks and Military School**	Scattered thru city and at airfield		50,000
	Landing Beaches ***		Along coast in radius of approximately 2 miles of the city; reported to have pillboxes at 150-yd. intervals (unconfirmed).	6 sq. mi.

*Limited to tactical targets only by JCS 825/3.
**To be attacked with HE then persistent gas.
***To be attacked with either nonpersistent gas or persistent gas.

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NO. 3356
18 MAY 1944

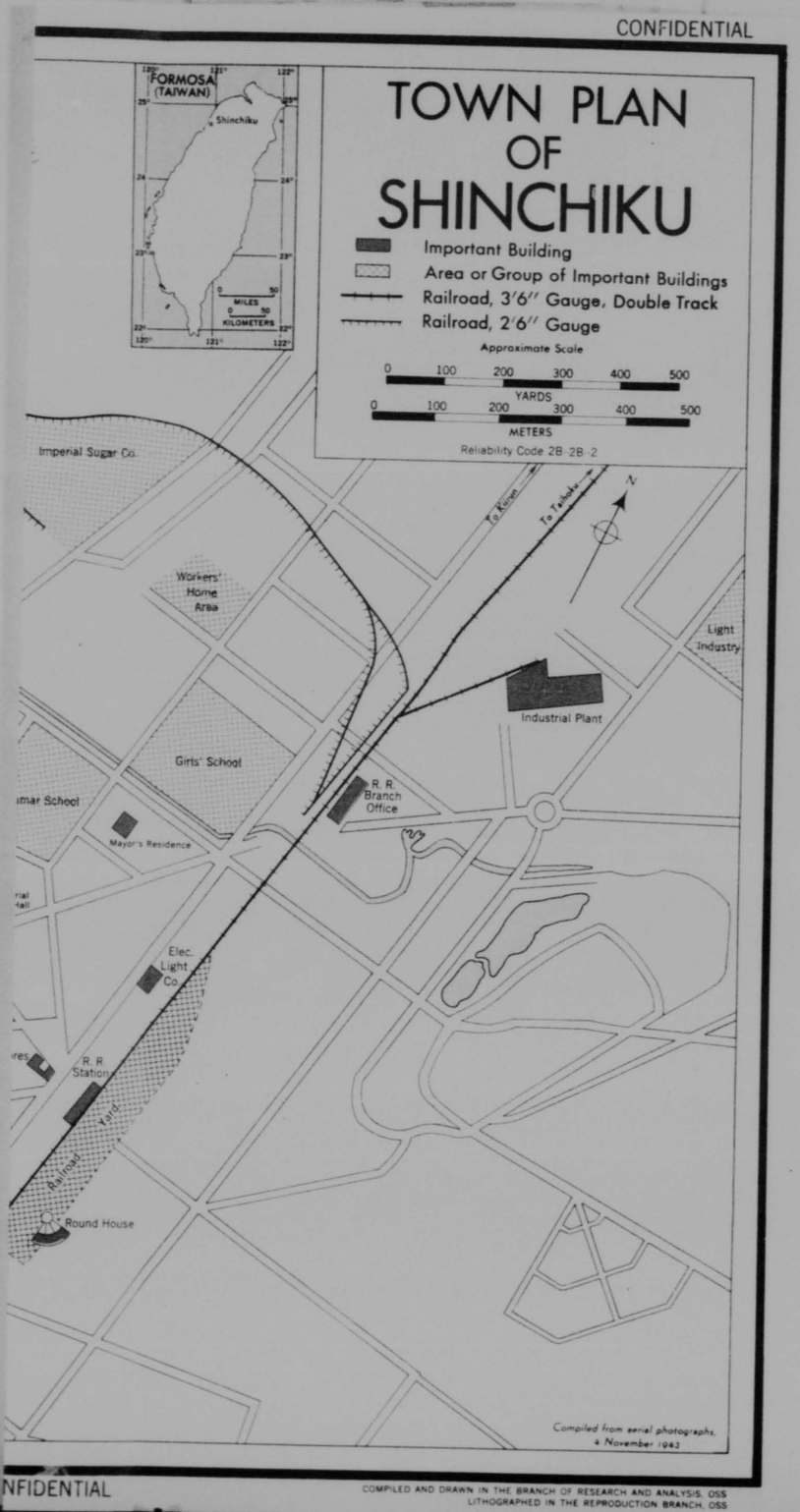
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HEITO

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HEITO

Location: About 14 miles east and slightly north of Takao, Latitude 22° 40' N, Longitude 120° 28' E.

Population (1940): 54,756, including 6,747 Japanese.

References:

a. Interim Report "Formosa" dated April 1944, prepared by AC/AS Intelligence.

b. JANIS of Formosa, Vols. I, II and III, dated June 1944.

c. "Selected Aerial Objectives for Retaliatory Gas Attack on Japanese Controlled Mainland Installations" dated August 1944.

d. Civil Affairs Handbook, Taiwan (Formosa", Takao Province, OP NAV 13-22, Office Chief Naval Operations, Navy Department, dated 1 October 1944.

I. Importance.

a. The Heito Airport is a large, well-equipped field. Its facilities include a secondary air depot, where some last-phase modifications or minor assembly is done. Between the airport and Heito Proper are several groups of barracks and military schools. Other small barracks areas - occupying converted school compounds - are scattered throughout the town.

b. A prison-like barracks area, covering some seven acres, is located about four miles east of town. The camp comprises some thirty buildings and the compound is inclosed by two high walls. While confirming evidence is lacking, it is possible that this may be the Allied prisoner of war camp which has been reported in this vicinity.

c. It has good transportation facilities and is an important commercial center.

II. Terrain.

a. Heito is located on the low western plain of western Formosa, about two miles east of the Katensui-Kei (stream). The channels of this stream form a mile wide valley and are a major obstacle in the wet season. A small stream flows along the eastern edge of the built-up area. Heito is accessible by a number of railroad lines and by a network of highways from all directions; the town is on the main line of the west coast railroad and on the main west coast road. Soils in this area are predominately medium textured loams; it is generally

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trafficable except in wet weather. Many rice paddys are in the vicinity; ribbon areas of grass extend along Katansui-Kei; trees are green throughout the year.

b. The built-up area of the city is irregular in outline, but practically all of it is within a square measuring 7,000 feet on a side. Several military areas, with streets that intersect at right angles, adjoin the main built-up area; extensive barracks have been built in Heito. Little information is available regarding buildings but they are presumably similar to those in other Formosan cities.

c. A large, completely equipped airfield is located on the east bank of the Katansui-Kei, about 1-2/3 miles west of the city. Adjoining it to the north, a new airfield was in process of construction in January 1944.

d. The Katansui-Kei and the Toko-Kei are not navigable except to shallow-draft boats; they have steep banks 10 to 40 feet high, and swift currents. Fording or bridging would be easiest from November through February; these rivers are major obstacles to all operations crossing the plain extending from the landing beaches on each side of Takao to the western foothills.

IV. Gas Targets*

Target Number	Target Name	Coordinates	Comment	Estimated Area Sq. Yards
	Barracks**		These are especially concentrated around airfield; two other barrack areas are in southern part of city; one about 3,800 ft. southwest of railroad yards; the other about 2,800 ft. west of the railroad yards. Permanent installations.	144,000
57	Air Base**	22° 41' N 120° 27' E	Training center and repair shops. Permanent installations	1,046,000
55	Shimo Tansui RR Bridge **		5,000 foot steel girder bridge	17,000

* Limited to tactical targets only by JCS 825/3
** To be attacked with HE then persistent gas

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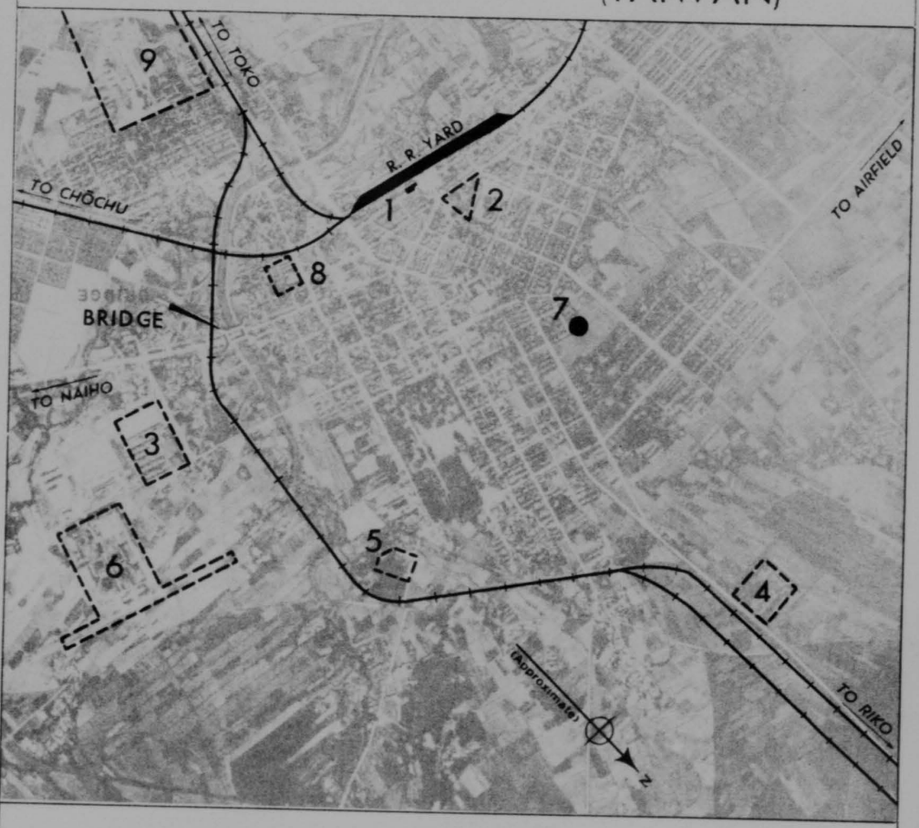
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HEITŌ

FORMOSA (TAIWAN)



AIRPHOTO FROM: *Photo Intelligence Report, No. 461, Dec. 1943*

0 500 1000
YARDS

1 Railroad Station and Yards
2, 3, 4, 5 Barracks
6 Water Filtration Plant
7 Transformer Sub Station
8 Industrial Plant
9 Alcohol and Sugar Refinery

NO. A-3410-RA, OSS
24 MAY 1944

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TOKO

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TOKO

Location: On the Southwestern coast of Formosa. Latitude 22° 27' N, Longitude 120° 27' E.

Population (1935) 18,259 including 293 Japanese.

References:

a. Interim Report "Formosa", dated April 1944, prepared by AC/AS, Intelligence, Washington, D. C.

b. JANIS (No. 87) of Formosa (Vols. I, II and III) dated June 1944.

c. Civil Affairs Handbook, Taiwan(Formosa), Takao Province, OPNAV 13-22, Office, Chief, Naval Operations, Navy Department, dated 1 October 1944.

I. Importance

a. Toko, the largest of the many small commercial centers serving the densely populated farming region southeast of Takao, is important as a river port for small craft. It is a market for cargoes of rice, sesame seeds and sugar cane drawn from the area tributary to the lower valleys of the Toko-kei and Katausui-kei. A number of recently constructed military and naval installations, including a large sea-plane base, give the town military importance.

II. Terrain

a. The port of Toko is formed by the mouths of the Toko and the Shimotansui Rivers, and is behind a coastal beach ridge. The town is a hub of secondary railroads and is on a spur of the main west coast line; it is at the junction of a coastline road and a road running north. Ribbons of grassland extend along the banks of the streams and along the coast south of Toko; rice and sugar cane are grown to the east and to the north. It is reported that rubber plants introduced near Toko were producing in 1941. Soils are predominately medium-textured alluvial loams; they are in general trafficable except during and immediately after precipitation.

b. The built-up area is scattered over a series of "islands" of dry land, which rise from the surrounding marshes, ponds and rivulets and is approximately 5/8 square miles in area. The street pattern is irregular, conforming to the shape of the "islands". Only the main streets continue from one "island" to another by bridges or causeways. There is a large sea-plane base with repair shops and warehouses on a lagoon one mile east of town; an airfield was reported to be under construction in the area in 1941. One barrack section area is on a former marsh in the southeastern section of town; the other is 1/2 mile north of the sea-plane base.

c. The Toko-Kei has steep banks, 10 to 40 feet high, its bottom is stony; its currents are swift. Fording or bridging would be easiest from November through February; by-passing would be impractical, if not impossible. Sand bars, with water from six inches to five feet at low tide, obstruct passage

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at the mouth, but there is good anchorage used by Japanese warships about 2.2 miles southeast. Immediately off-shore from Toko, between the mouth of the rivers and Sho Ryuku (Lambei Island), the water is extraordinarily deep. The river is not navigable except by shallow draft boats. Good landing beaches with good exits extend along the coast north and south of the town.

III. Gas Targets*

AAF Target No.	Target Name	Coordinates	Comments	Estimated Gas Gas Target Area Sq. Yds.
162	Toko seaplane base**	20° 27' N 120° 27' E	Major seaplane station with 6 large hangars, several shops and storage bldgs; small power plant.	764,400
	Barracks Area**	22° 27' N 120° 30' E	Permanent but not at seaplane base	186,000
	Landing Beaches***	Probable terrain over which eml. operations will be conducted		4 square miles

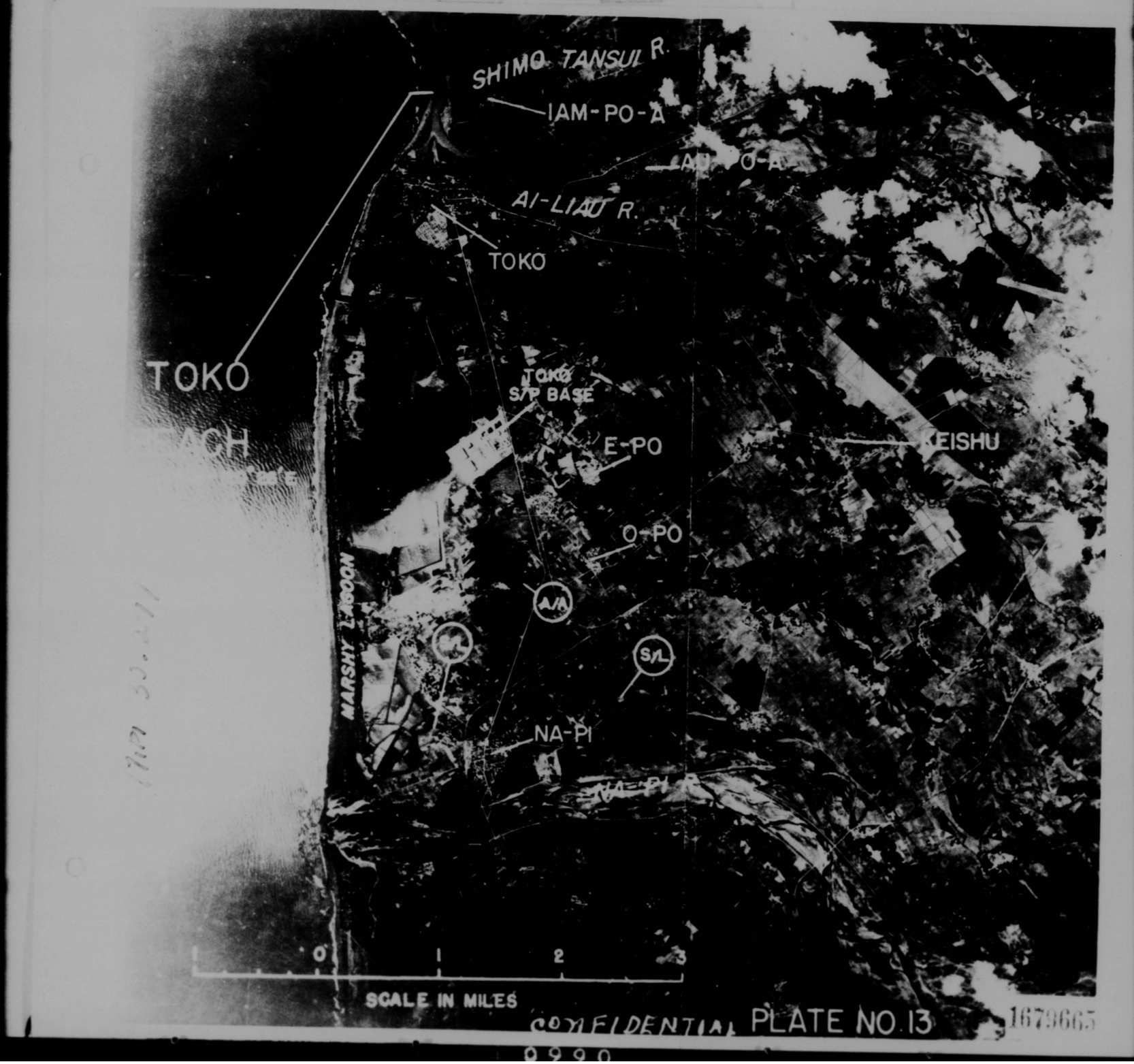
* Limited to tactical targets only by JCS 825/3
** To be attacked with HE, then with persistent gas
*** To be attacked with either nonpersistent gas or persistent gas

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FORMOSA CITY PLANS 1:10,000

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TOKO

FIRST EDITI

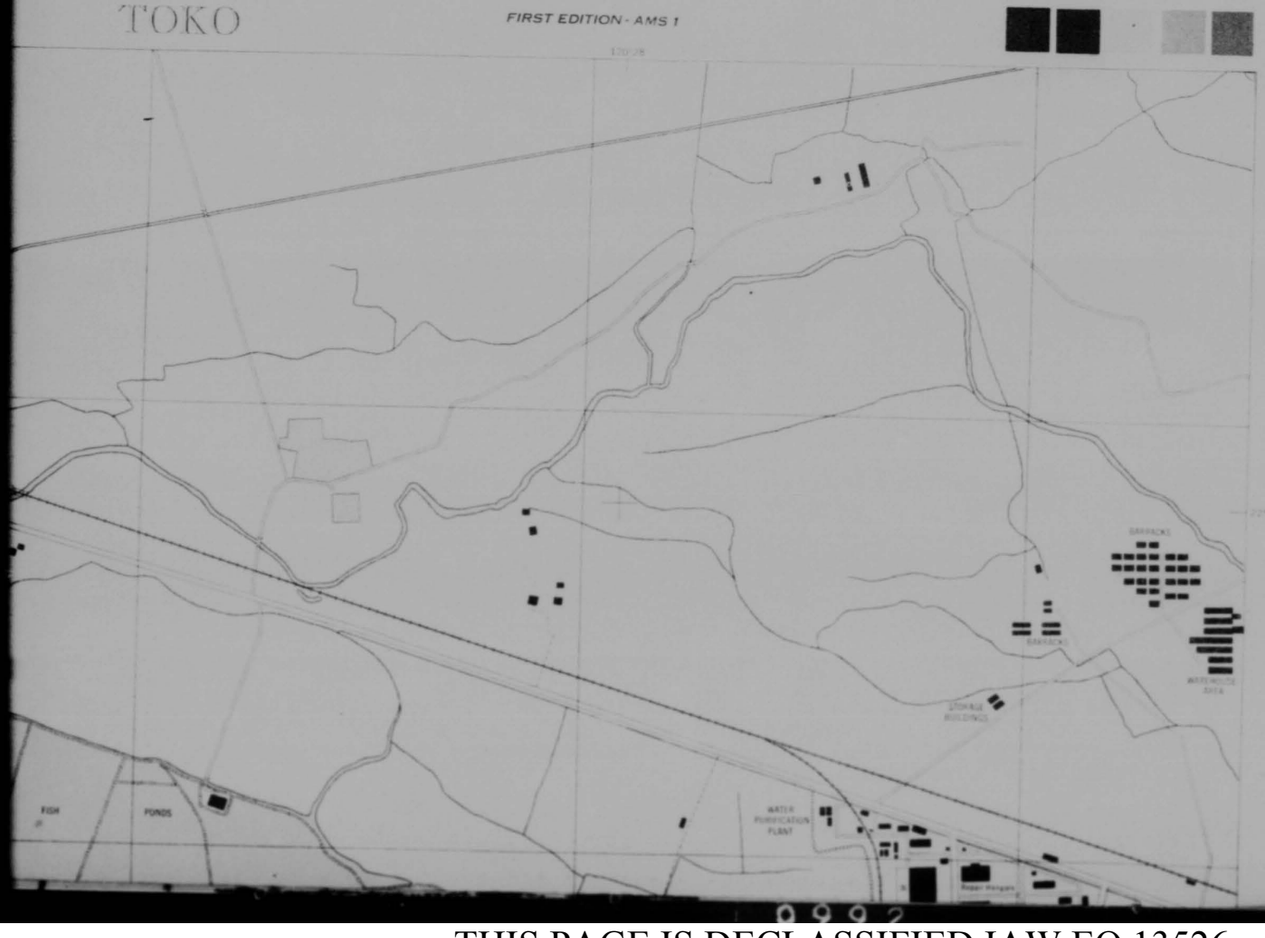


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A.M.S. L991. First Edition (AMS 1), 1944.

Prepared under the direction of the Chief of Engineers, by the Army Map Service (AMS), U. S. Army, Washington, D. C. Compiled in 1944 from aerial photography dated November 1943 and June 1944 by photo-planimetric method and by reference to Formosa 1:50,000, A.M.S. sheet 2114 II, 1944. Additional information from intelligence data. Place names are transcribed according to the Modified Hepburn (Romaji) System.

Scale 1:10,000

500 0 500 Meters

500 0 500 Yards

POLYCONIC PROJECTION

LEGEND

GLOSSARY

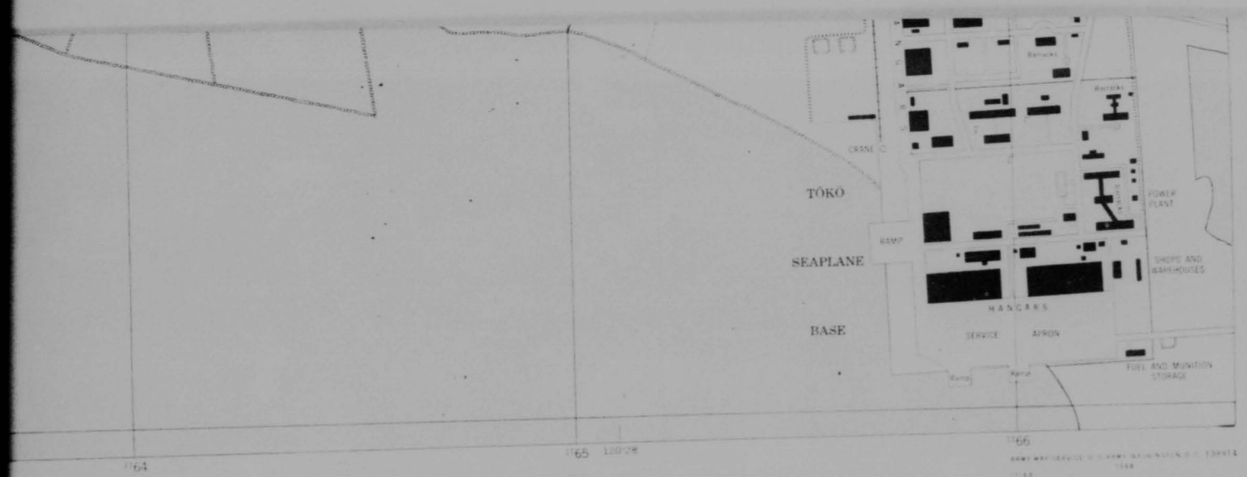
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Scale 1:10,000

Mile

400 Meters

500 Yards

POLYCONIC PROJECTION

GLOSSARY

INDEX TO BOUNDARIES

COVERAGE DIAGRAM

TOKO, FORMOSA (TAIWAN)

TAKAO-SHŪ

N2227-E12026-2/1.4x2.6

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KARENKO

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KARENKO

Location: On the eastern coast of Formosa. Latitude 23° 59' N. Longitude 121° 36' E.

Population (1935): 15,464 including 6,336 Japanese

References:

a. Interim Report "Formosa" dated April 1944, Office AC/AS, Intelligence.

b. JANIS of Formosa, Vols. I, II and III, dated June 1944.

c. "Selected Aerial Objectives for Retaliatory Gas Attack on Japanese Controlled Mainland Installations" dated August 1944.

d. Civil Affairs Handbook, Taiwan (Formosa", Karenko and Taito Provinces, OP NAV 13-24, Office Chief, Naval Operations, dated 1 October 1944.

e. Strategic Engineering Study No. 100: Summary Formosa (Taiwan) Terrain Intelligence, Office, Chief of Engineers, dated July 1944, US Army.

I. Importance.

a. Karenko is the largest town and has the best port on the eastern sea coast of Formosa. It is a trading center for the surrounding plain and valley to the south and has a large number of electro-chemical and electro-metallurgical plants. Four miles north-northwest of the city is an airfield fully equipped to handle large planes.

II. Terrain

a. A trough-like valley runs parallel to the eastern shore line of the island for a distance of 75 miles behind a narrow coastal mountain range. At its northern end, the valley meets the sea obliquely in a coastal plain, 10 miles in length, which narrows rapidly to the north. The town of Karenko lies on this coastal plain, about 3 miles north of its southern boundary, against the abrupt slopes of the northeastern tip of the coastal range. The city borders the sea just to the south of the Beiron-Kei; its artificial port lies about 1 mile north along the coast. West and southwest of the town are grass lands, rice paddys and sugar cane fields; south and north of the city strips of marsh lands and belts of grass. Along the coast is a narrow strip (about 3 miles wide) of medium textured alluvial (loams) soils; west of this strip, the floor of the valley is predominately course-textured alluvial (sandy and gravelly) soils. Such soils are trafficable except during and immediately after precipitation.

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b. The built-up area of Karenko is rectangular in shape with the long side about 1400 yards and the short side about 1100 yards; the street pattern is cut by one major and several minor diagonals. A railroad, the only line on the east coast runs south through the valley to Taito. A road runs about 50 miles south along the interior valley. A large airport is located just north of the port. The city would probably be defended by the Japanese.

c. The Taito-Karenko corridor is about 90 miles long, averages 3 miles wide and is commanded by 200 to 5,000 foot mountains on both sides. It could be blocked. Its generally level floor is locally suitable for airfields. Cross-country movement must cross many swift, small streams. Existing roads cross the corridor from side to side to avoid the streams. Vehicles or equipment could not get out of this area by land except over established routes. Foot troops would find cross-country movement out of this corridor extremely difficult or impossible. The banks of the streams are generally low and steep, but are high and steep where a stream cuts against a terrace or against the valley side; the bottoms are flat and full of boulders. The best months, for fording or bridging are from December through April; these streams could not readily be by-passed. None of these streams is navigable.

d. An almost continuous stretch of sandy beach (50 feet or more in width) extends for about 14 miles between the mouth of the Karen-Kei and that of the Tatsu Kiri-Kei. Sea conditions are best from the end of spring to the middle of summer, otherwise, surf usually heavy. A plain backs the beach and extends inland about 4 miles. It is crossed by a network of railroads, roads and trails (reliability - fair).

III. Gas Targets*

AAF Target Number	Name	Approximate Location	Comments	Estimated Area sq. yds.
	Barracks**	23° 59' N 121° 36' E	Permanent Barracks	50,000
	Airfield**		2 hangars, each capacity of 6 aircraft; fuel tanks, 3 barracks, aircraft factory adjoins field, also naval air base.	30,000
	Taiko-Karenko Corridor***		Tactical Operations	5 sq. mi.
	Landing Beaches***		Tactical Operations	5 sq. mi.

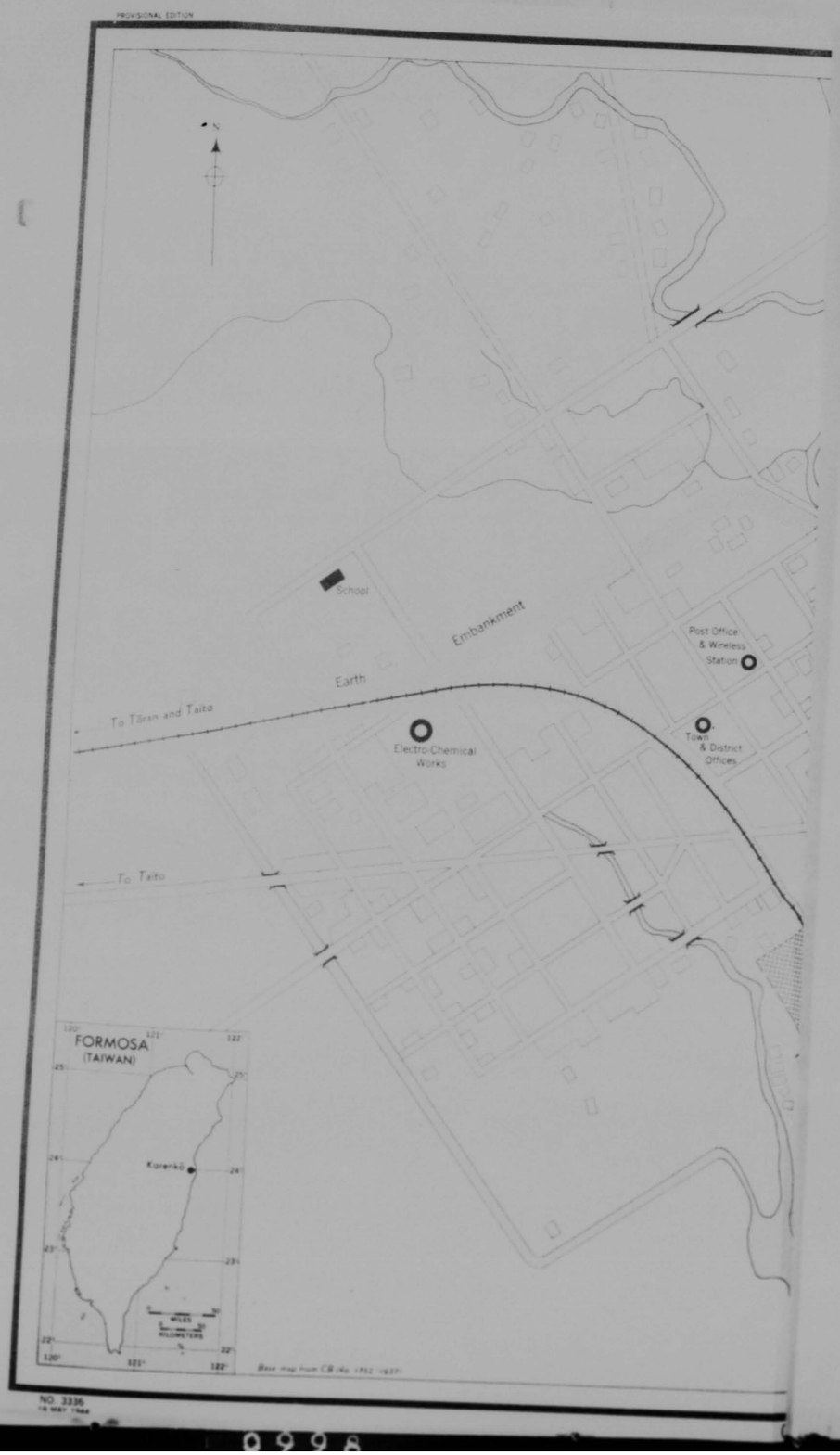
* Limited to tactical targets only by JCS 825/3
** To be attacked with HE then persistent gas.
*** To be attacked with either nonpersistent or persistent gas.

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OKAYAMA

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OKAYAMA

Location: On the western coastal plain of Formosa, Latitude 22° 48' N, Longitude 120° 16' E.

Population (1935): 15,285 including 429 Japanese

References:

a. Interim Report "Formosa", dated April 1944, prepared by AC/AS Intelligence.

b. JANIS of Formosa, Vols. I, II, and III, dated June 1944.

c. Civil Affairs Handbook, Taiwan (Formosa), Takao Province, OPNAV 13-22, Office, Chief, Naval Operations, Navy Department, dated 1 October 1944.

I. Importance

a. Okayama, once a market town for a densely settled agricultural area of the southwestern coastal plain has recently gained considerable industrial and military importance. A large airfield and an airplane repair and assembly plant lie to the west between Okayama and Hida.

II. Terrain

a. Okayama is in the southern part of the western coastal plain, less than four miles inland from Formosa Straits and about midway between Takao and Tainan. It is a hub for secondary roads and railroads; it is on the main west coastal highway and railroad; it has no port or other water connections. The surrounding area is flat, with numerous streams, and is dotted thickly with agricultural villages, and rice and fields of sugar cane. Soils are predominately medium-textured loams; it is generally trafficable except in wet weather. Many rice paddys are in the vicinity; stream channels and valley edges are fringed with ribbons of grassland; tree leaves are green throughout the year.

b. Okayama, exclusive of the airfield and aircraft plant, is approximately a square of 5600 feet to the side. About 2 1/2 miles south of the railroad station is an airfield of about 500 acres; the intervening territory is almost completely built up. Extensive new installations of barracks, huts and administrative or storage facilities surround the airfield and the town.

c. The 1,000 foot peak, Taiko-zan, is about five miles to the northeast. Two streams winding through the area have made necessary a dozen or more highway and railroad bridges on the approaches to the city. Low banks (less than 50 feet high) confine the streams. The bottoms are generally stony and flat. Currents are swift. These streams can be forded or bridged with some difficulty; such operations are easiest from November through February. These streams are not navigable except to shallow-draft boats.

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III. Gas Targets

AAF Target Area	Name	Coordinates	Comments	Estimated Gas Target Area Square Yards
	Barracks**	22° 47' N 120° 15' E	Permanent Installations	233,000
	Gun Positions**	22° 47' N 120° 15' E	Permanent Installations	86,000
	Warehouses **	22° 47' N 120° 15' E	Repair shops, warehouses and administrative buildings.	611,000
	Landing Beaches ***	22° 47' N 120° 14' E	Landing beaches with suitable exits within 12 miles of Okayama	10 sq. mi.

*Limited to tactical targets only by JCS 825/3
**To be attacked with HE and then persistent gas
***To be attacked with either persistent or nonpersistent gas.

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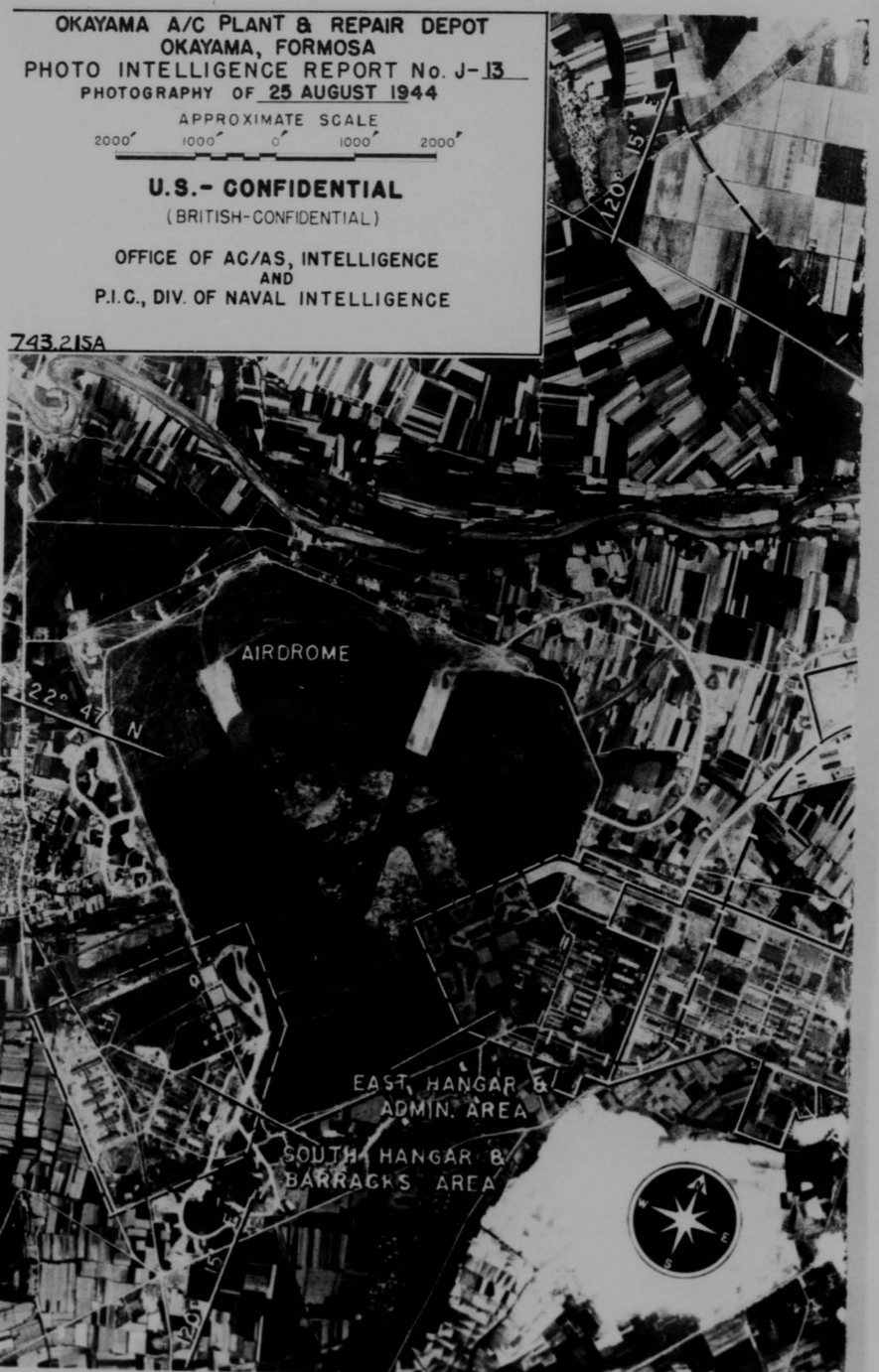
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OKAYAMA A/C PLANT & REPAIR DEPOT
OKAYAMA, FORMOSA
PHOTO INTELLIGENCE REPORT No. J-13
PHOTOGRAPHY OF 25 AUGUST 1944
APPROXIMATE SCALE
2000' 1000' 0' 1000' 2000'

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FORMOSA CITY PLANS 1:10,000

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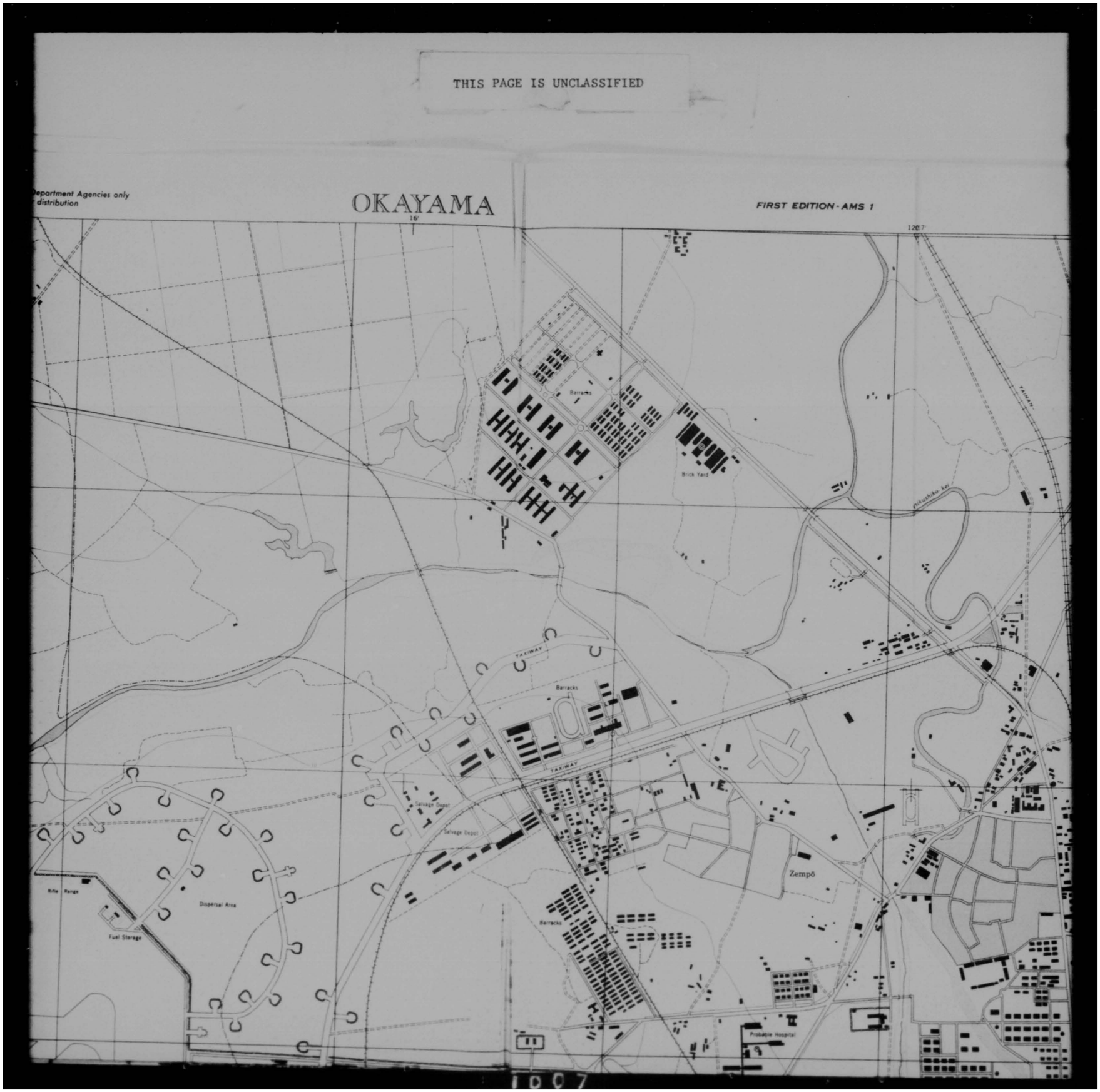


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LEGEND

Areas densely built up
Areas moderately built up
National or Prefectural Road generally metaled over 6 m. wide
Road, 7.4 meters wide
Track or Trail
Railroads
3'6" gauge, Single track with Station
3'6" gauge, Double track
Narrow, Light, or Special gauge, Single track
In street, labeled with gauge
Boundaries
Prefectural (Dō or Shi)
Gun or Shi
Kai or Shō
Earth covered buildings
Temple, Shrine, Pagoda
Church, Monument or Statue, Dam
School, Chimney
Prison, Radio mast, Mine
Ship Anchorage, Fence, Cemetery
Water wheel or mill, Mineral spring, Fumarole
Control point, Bench mark, Spot elevation
Generally Rice or Sugar Cane
Orchard or Vineyard, Bamboo
Mud or Tidal Flat
High tension line
Masonry retaining wall or Revetment Falls

1 Mile
1000
1000

APPROXIMATE MEAN DECLINATION 1944
FOR CENTER OF SHEET
ANNUAL MAGNETIC CHANGE 17' DECREASE
Use diagram only to obtain numerical values.

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Scale 1:10,000

1 Mile
1000 Meters
1000 Yards

POLYCONIC PROJECTION

CONTOUR INTERVAL 10 METERS

ONE THOUSAND YARD WORLD POLYCONIC GRID, BAND (13), ZONE "D"
THE LAST THREE DIGITS OF THE GRID NUMBERS ARE OMITTED

NOTE: OFFICERS USING THIS MAP WILL MARK HEREON CORRECTIONS AND ADDITIONS WHICH COME TO THEIR ATTENTION AND MAIL DIRECT TO THE CHIEF OF ENGINEERS, WASHINGTON, D. C.

GLOSSARY

-gun	county	-shō	township
-kai	township	-shū	prefecture
-kei	river, stream		

HEIGHTS IN METERS

INDEX TO

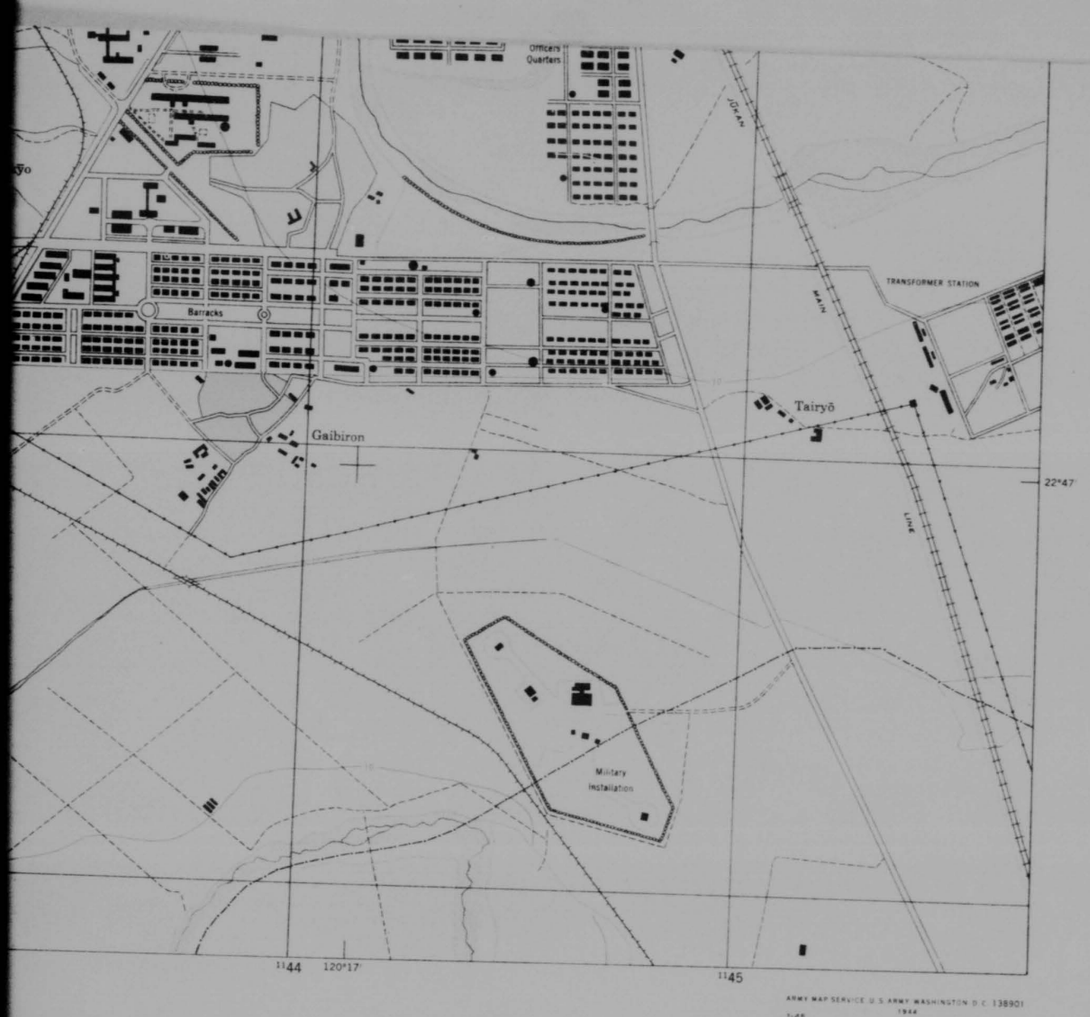
Takao-shō
Okayama-gun
a. Mido-shō
b. Okayama-kai
c. Nanshi-shō

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OKAYAMA, FORMOSA (TAIWAN)
TAKAO-SHU

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MAKO

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MAKO

Location: Mako is on the western side of Boko-to in the Pescadores Islands. Latitude 23° 34' N, Longitude 119° 34' E.

Population(1935) 7,854 including 2,041 Japanese.

References:

a. Interim Report "Formosa", dated April 1944, AC/AS, Intelligence, Washington, D. C.

b. JANIS of Formosa, Vols. I, II and III dated June 1944.

c. Civil Affairs Handbook, Taiwan (Formosa), the Pescadores Islands, OPNAV 13-21, Office, Chief, Naval Operations, Navy Department, 1 September 1944.

d. Strategic Engineering Study No. 100, Summary Formosa (Taiwan) Terrain Intelligence, Office, Chief, Engineers, U. S. Army dated July 1944.

I. Importance

a. Mako, the largest town and principal port of the Pescadores Group, is a center of supply, communications and administration. Anzan Naval Base, on Sokutem-to, across the bay from Mako, gives the town strategic importance. Its present primary functions (from a military viewpoint) are convoy control, aircraft detection and defense and defense outpost for Formosa and the strait area against seaborne attack.

II. Terrain

a. Mako is situated on the north shore of Jokoku-Wau (Junk Bay), the northern inlet of Mako Harbor; it occupies the greater part of a low peninsula which commands the northern entrance to Junk Bay and Mako-Ko. Broad sandy beaches are on outer coast of peninsula on the south side of the harbor. Mako is easily and rapidly reached by road from all parts of the island Upland rice, sugar, vegetables and tea are grown in the surrounding country; heavy dikes and hedges are among the fields. Small patches of woodland (mainly banyan, mulberry and pandonus) are along the coast on either side of the city. Medium textured alluvial (loams mostly derived from basalt) soils predominate; there are a few patches of fine clays. Such soils are trafficable except during and immediately after precipitation.

b. Mako is about 1/2 mile long, north-northeast to south-southwest, and a little more than 1,000 yards wide. The city plan is determined by the irregular shape of the peninsula. In the center of the town, the maze of alleys in the old Chinese city is little changed. Scattered through the town are five barrack areas. The principal landing field is believed to be on the peninsula south of Mako-Ko, some eight miles by road from Mako.

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c. Mako Island, for the most part, is flat. Except for the sandy beaches on the south, the coast line consists of basalt rocks and reefs with a covering of limestone over most of them. Sabo-San, a hill about 142 feet high, and very conspicuous, is on the southern shore of Mako-Ko. Air photos show at least ten apparent stream valleys on Mako (Boko) Island, but only the lower reaches of 1 or 2 appear to contain water. These streams would have little or no effect on cross-country movement; none are navigable. A complete highway and road net, and causeways connect this island with Chuton-sho and Hakusa-to to the north and Soku-ten-to to the south. There are no railroad facilities on the island. Two cables connect Mako with Hotei and Ampin, Formosa. A mine field is reported to have been laid in the southwest approaches to Mako in July 1941. The whole of the island is fortified with A/A and C/D guns.

III. Gas Targets*

AAF Target No.	Name	Approximate Location	Comments	Estimated Area Square Yards
152	Barracks, Repair Shops and Stores, Ansan Naval Base **	23° 33' N 119° 34' E	Located on small island connected to Bako only by a causeway, base occupies area about 2200 by 2200 ft. Facilities include administrative and barracks bldgs. 400 ft. graving dock and repair shops, small power plant, two small oil tanks and a large coaling wharf.	200,000
151	Barracks Area Mako**	23° 34' N 119° 34' E	Permanent Installations	260,000
	Warehouses **	23° 34' N 119° 34' E	Believed used predominately for military stores	145,000
	Gun Positions***	23° 34' N 119° 34' E	Permanent installations	5,000
	Landing Beaches ***		Area over which it is probable, during appropriate weather, chemical operations would be conducted.	

*Limited to tactical targets only by JCS 825/3
**To be attacked with HE then with persistent gas.
***To be attacked with either nonpersistent or persistent gas.

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1. Revetted munitions storage.
2. Barracks area and parade ground. 9 buildings.
3. Barracks area and administrative area: 60 barracks, 6 administrative, [illegible] area.
4. Weather station.
5. Warehouse area: 17 buildings.
6. 4 Gun medium c.d. battery.
7. Old abandoned fort: 6 bldgs.
8. Barracks & storage area: 14 barracks, 1 storage, 2 piers.
9. Three piers.
10. Administrative area: 7 bldgs. (10 barracks & 2 [illegible])
11. Warehouse.
12. Boat basin: 3 storage, 1 coal yard.
13. Boatyard: 4 machine shops, 2 ways, 2 slips.
14. Power plant.
15. Water storage tank & tower.
16. Barracks area: 7 bldgs connected by covered walkways.
17. Revetted fuel & munitions storage area: 12 buildings.
18. Underground munitions storage
19. Warehouse & storage area: 7 buildings.
20. Water treatment plant.
21. Radio station.
22. Three gun light c.a. batt[illegible]
24. Underground fuel storage area.
25. Fuel storage area: 2 pier.
26. Barracks area: 24 barracks, 6 miscellaneous bldgs.
27. Parade ground.
28. Warehouse area: 6 bldgs.
29. Drydock, fabrication shop and storage buildings.
30. Two fuel tanks.
31. Two revetted fuel & munitions storage buildings.
32. Barracks & administrative area: 20 barracks, 2 T-shaped administration bldgs.
33. Power Plant, [illegible] native.
34. Underground storage.
35. Three piers.
36. Two radio towers.
37. Inner harbor.
38. storage area: 22 bldgs.
39. Landing point.
40. Small timber yard.
41. Water purification plant.
42. Wire storage building.
43. Power plant, in operation.
44. Fuel & munitions storage area: 20 bldgs, 1 pier.
45. One pier.

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GOSEI

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GOSEI (NITAKA)

Location: In the central part of the west coast of Formosa, Latitude 24° 16' N, Longitude 120° 31' E.

Population (1935): 5,413 including 53 Japanese.

References:

a. Interim Report "Formosa" dated April 1944, prepared by AC/AS, Intelligence, Washington, D. C.

b. JANIS (No. 87) of Formosa (Vols. I, II and III), dated June 1944.

c. Civil Affairs Handbook, Taiwan (Formosa), Taichu Province, OPNAV 13-26, Office, Chief, Naval Operations, Navy Department, dated 15 October 1944.

I. Importance

a. At Gosei, a large, artificial harbor is under construction. It is intended to serve as an outlet for central Formosa and thus relieve the congestion at Keelung (Kiirun) and Takao. A probable airfield and ten probable seaplane ramps are under construction about a mile north of the harbor entrance. About 60 administration buildings, barracks, and warehouses had been completed in March 1944.

II. Terrain

a. Gosei is about 13 miles northwest of Taichu. These towns are connected by a spur off the main coastal railroad; a new highway between them is still under construction. Gosei is on a low-lying fertile plain on which rice and sugar cane are grown. Soils are predominately fine-textured (clays) which are non-trafficable except in dry weather.

b. The built-up area of Gosei is roughly rectangular in shape, about 3,000 yards long and 300 yards wide. When all the construction is completed, the size of the town will be larger. The old harbor was at the mouth of a small stream; the new one will be north of town where most of the construction is located.

c. The coast immediately south of Gosei is not suitable for landing operations, suitable beaches extend northward along the coast for about 14 1/2 miles. Heavy surf makes landing difficult at Gosei (except in the artificial harbor); north of Gosei is a wide belt of surf offshore. Numerous trails lead inland about five miles to the main coastal highway. A railroad closely follows this highway.

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III. Gas Targets*

AAF Target No.	Name	Approximate Location	Comments	Estimated Gas Target Area Square Yards
	Barracks & Storage Areas**	24° 16' N 120° 31' E	Three barracks & is storage area. These may be supplemented when new construction is completed.	256,000
	Landing Beaches ***		Over which chemical operations will probably be conducted	5 sq. miles

*Limited to tactical gas targets only by JCS 825/3. Construction areas not included until work is completed.

**To be attacked with HE, then with persistent gas.

***To be attacked with either nonpersistent or persistent gas.

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GARAN-HI (GARANHI)

Location: A point at the southeastern tip of Formosa. Latitude 21° 55' N, Longitude 120° 51' E.

Population: Unknown

References:

a. JANIS (No. 87) of Formosa (Vols. I, II, and III) dated June 1944.

I. Importance:

a. Garan-bi is a strategic area rather than a town. The military and naval installations are reached by the main highway running northward along the west coast from which a cut-off leads to the east coast road. Among the installations are a lighthouse, a radio station, an army airfield, a naval air base, and a number of auxiliary buildings.

II. Terrain

a. Garan-bi is a cape formed by hills up to 600 feet in altitude; hills are steep or cliffed, ravined sides, rounded to flat-top. The cape ends in terraces which descend to the sea by a series of steep slopes or scarps, 20 to 180 feet high. On each side of the cape, the hills are bordered by strips of lowland 600 to 1300 feet wide. Hills are covered with woods and patches of grassland; thin stony soil. Terraces are of coral rock with stony, well-drained soil, cultivated and grassy. Narrow lowlands at foot of hills are generally sandy, with strip of trees (some palm) and grassy spaces. The airfield is near the tip of the cape.

III. Gas Targets*

AAF Target No.	Name	Coordinates	Comments	Estimated Gas Target Area Square Yards.
	Airport and Naval Air Base**	21° 55' N 120° 51' E	Permanent Installations	300,000

*Limited to tactical targets only by JCS 825/3.
**To be attacked with HE then with persistent gas.

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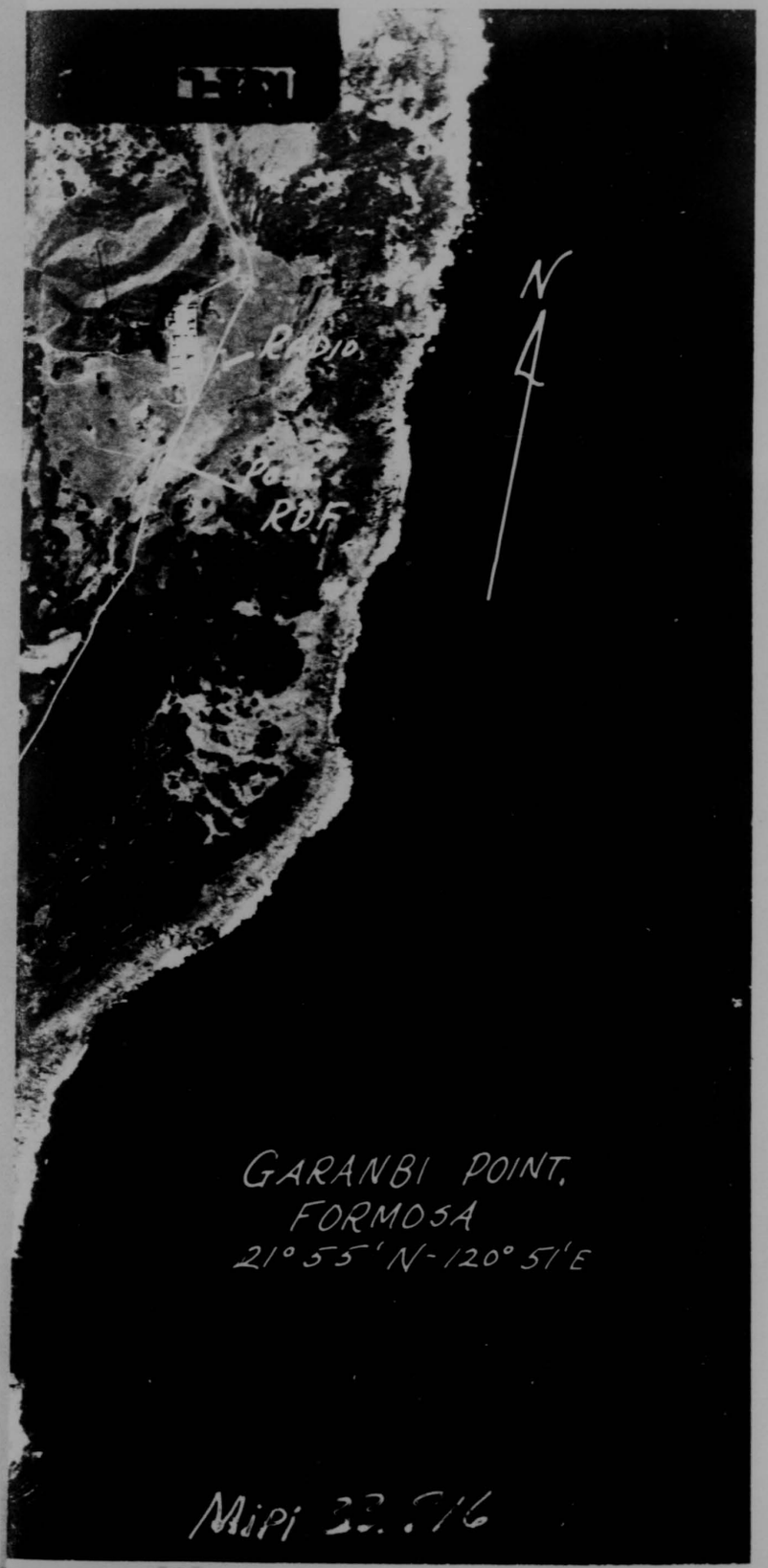
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19 SEP 1943

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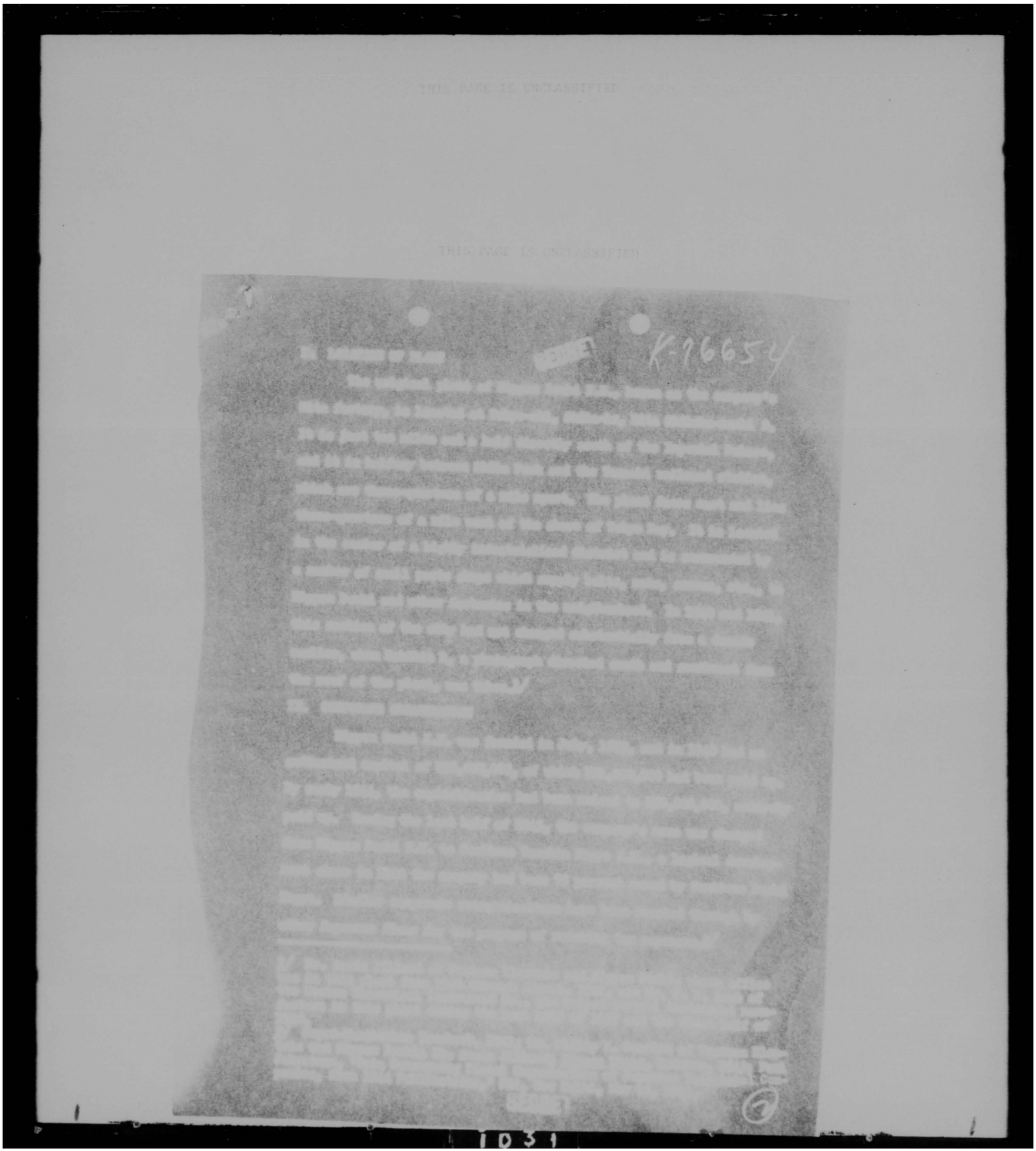
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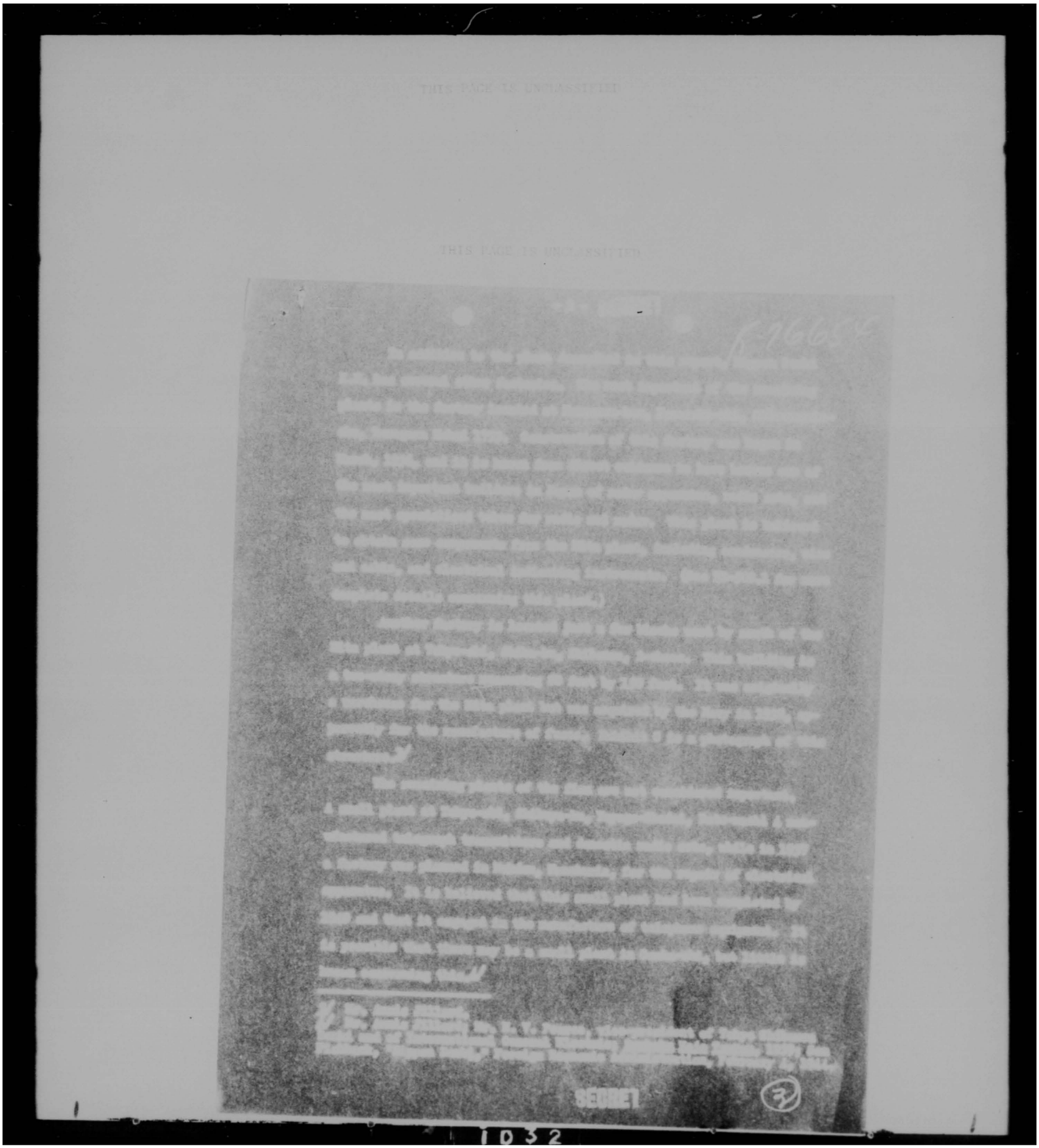
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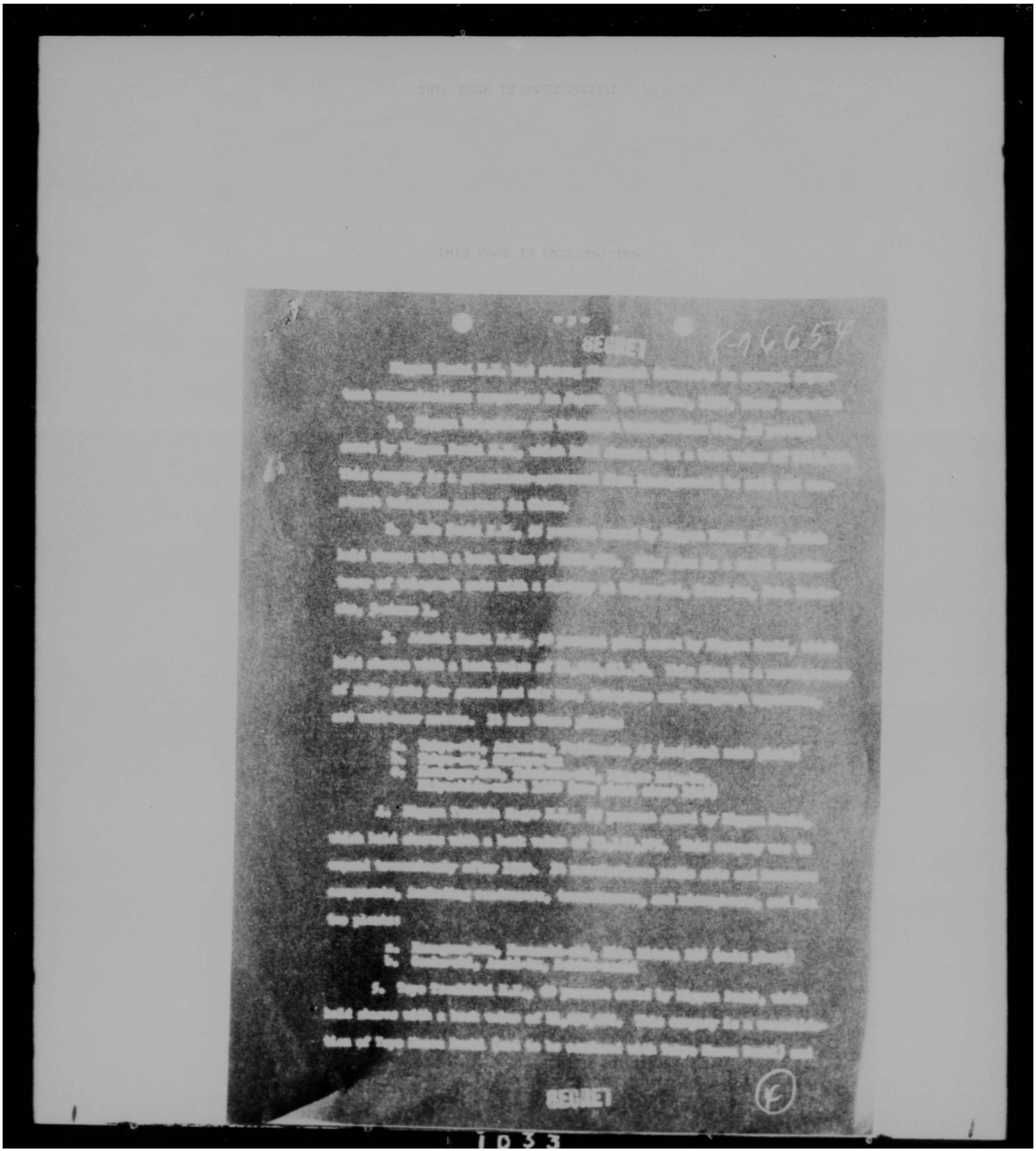
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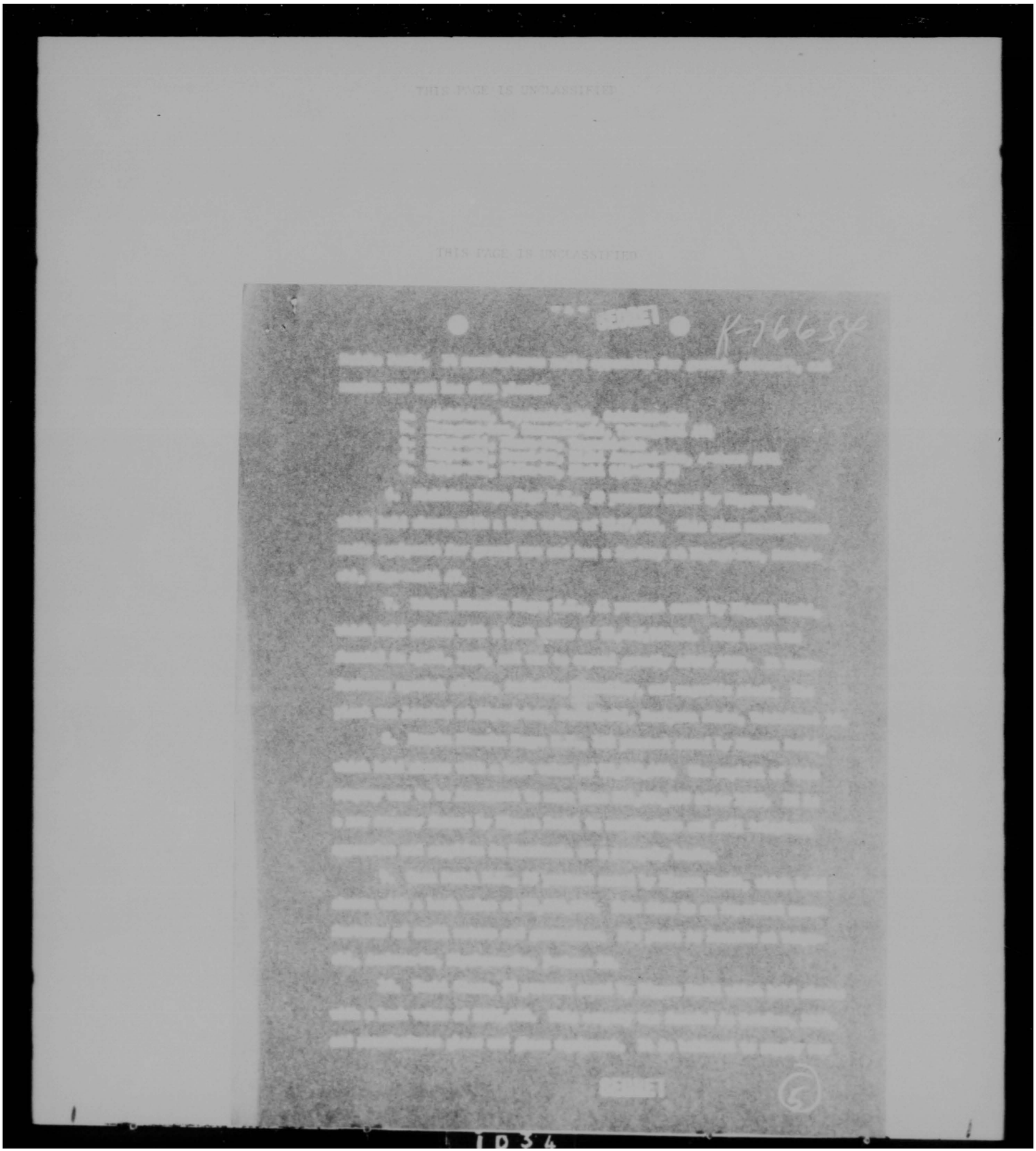
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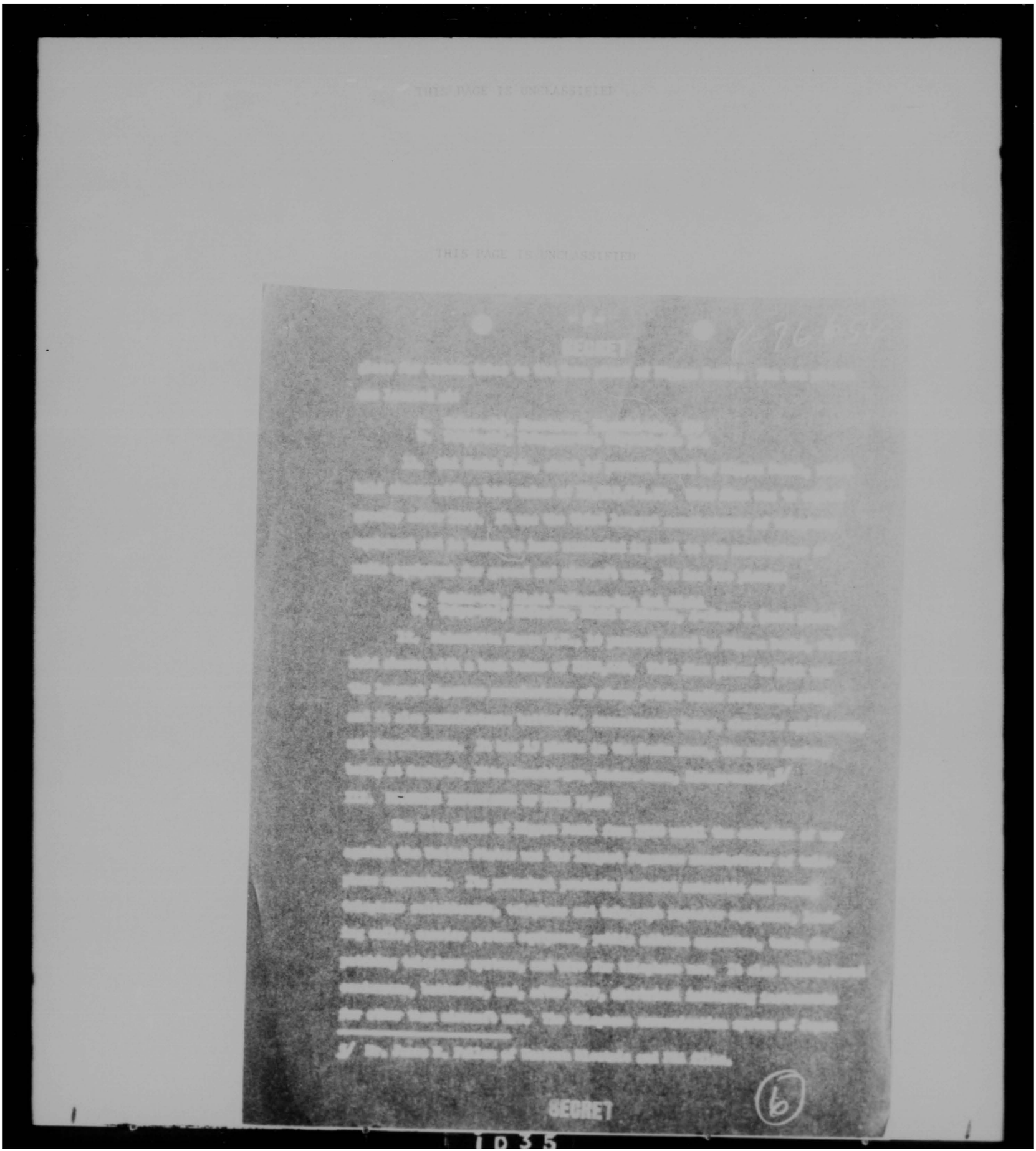
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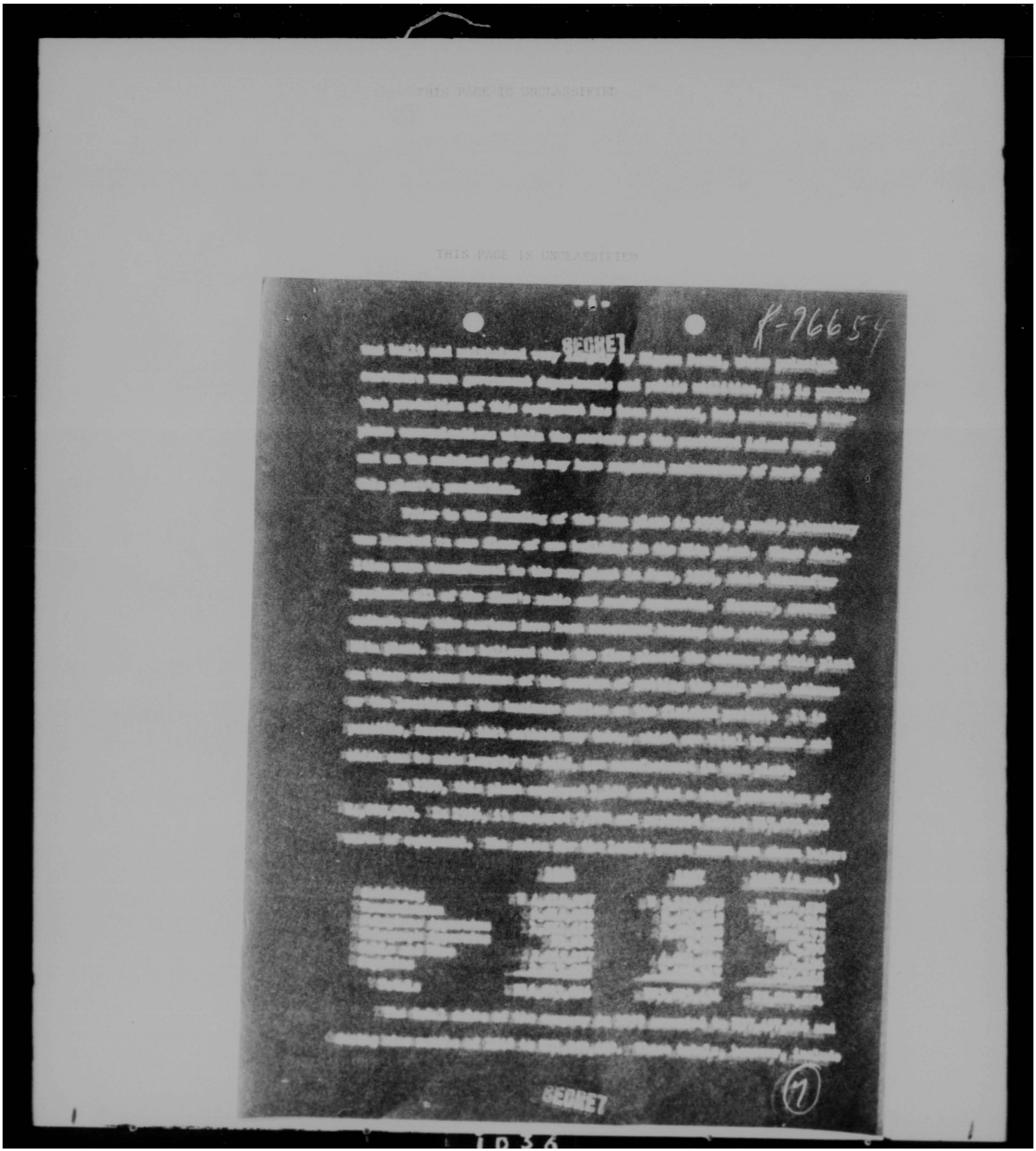
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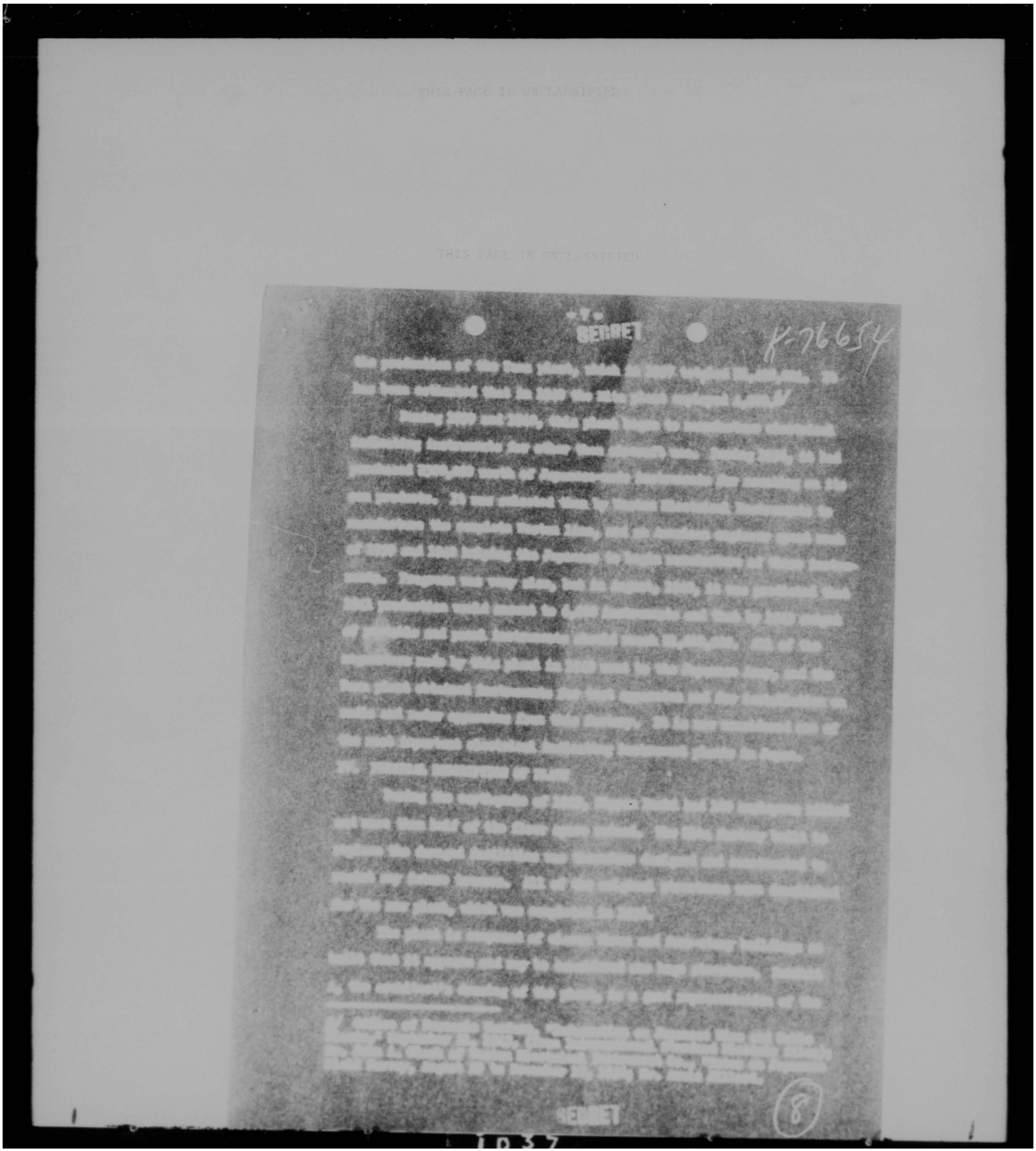
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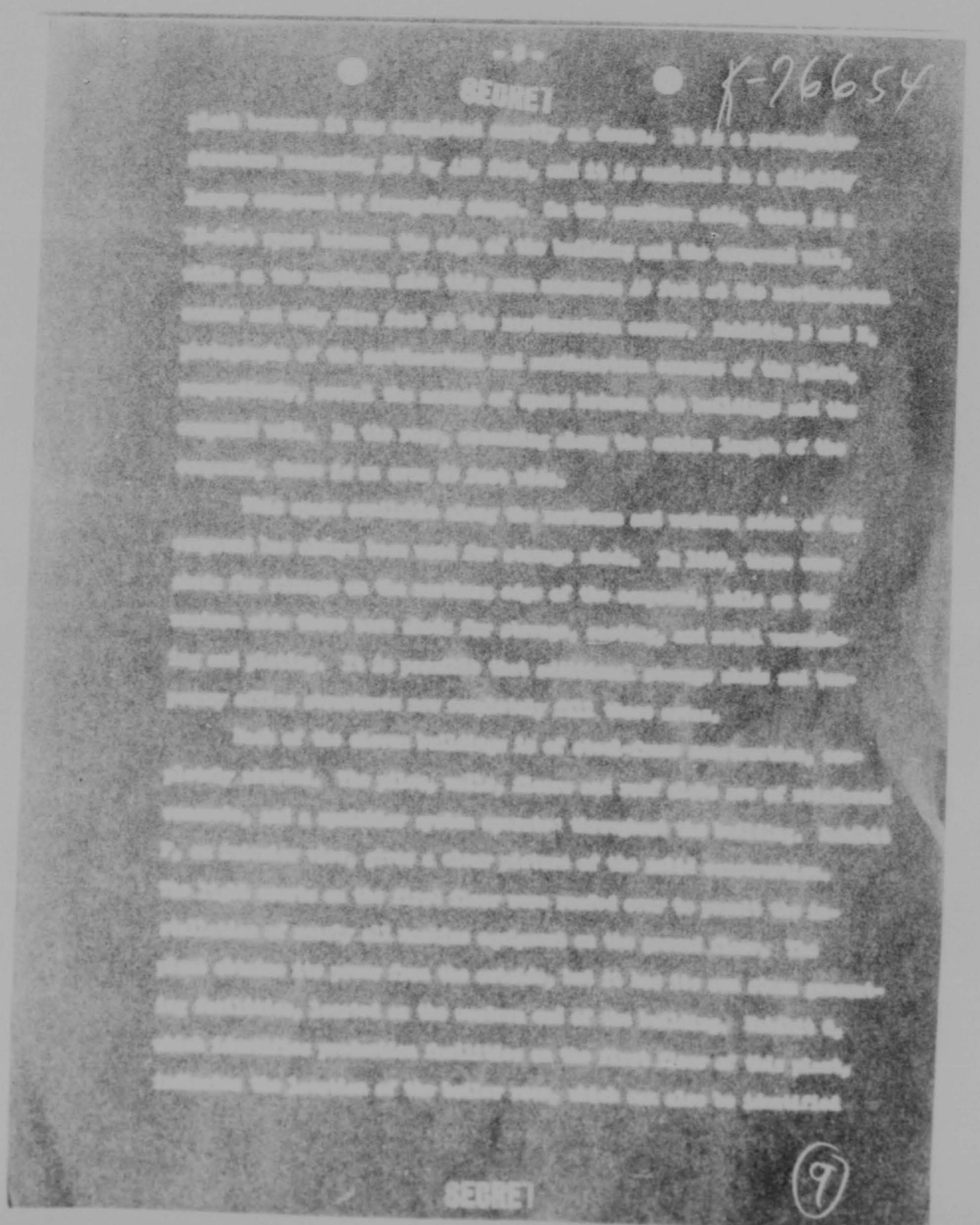
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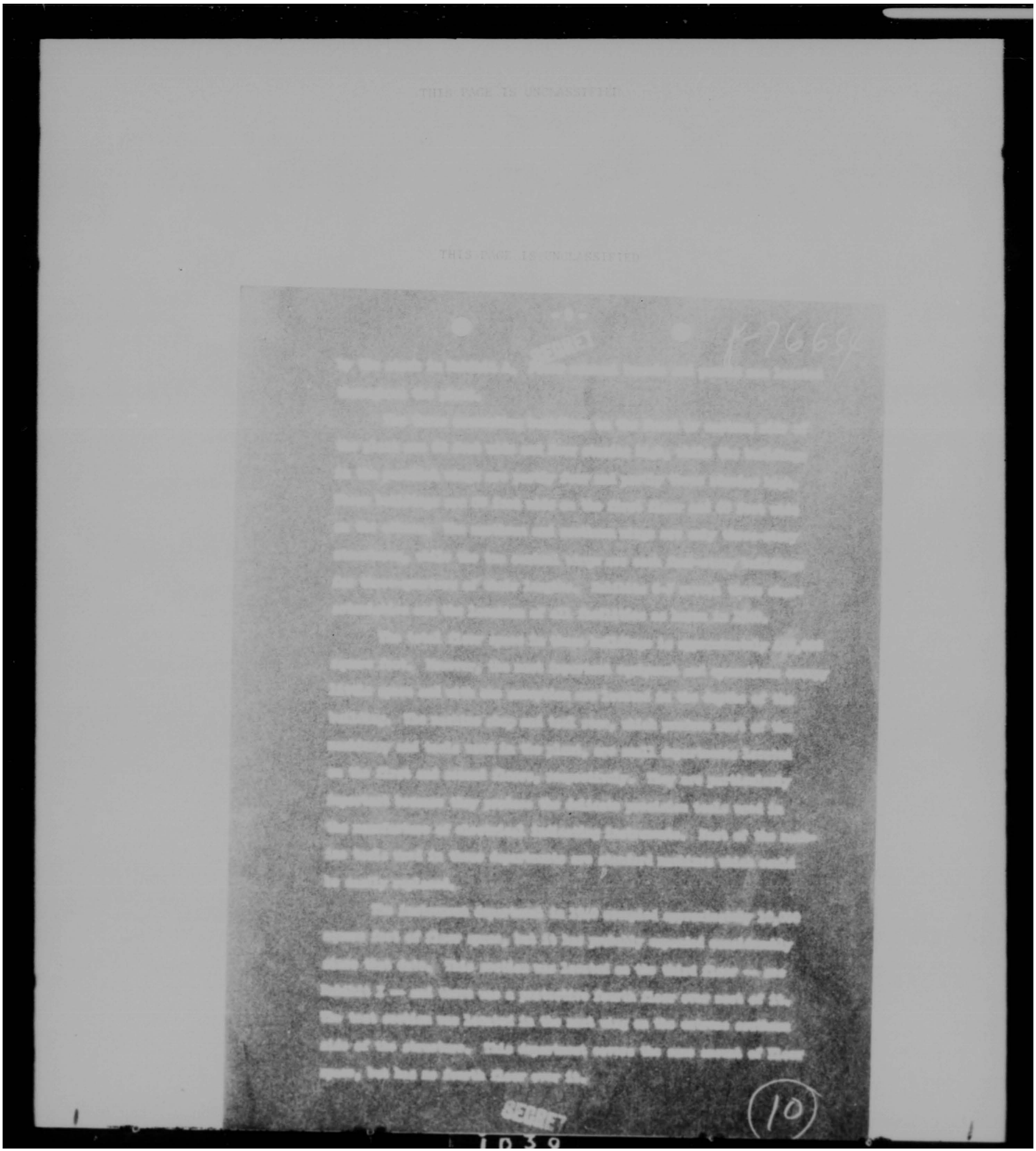
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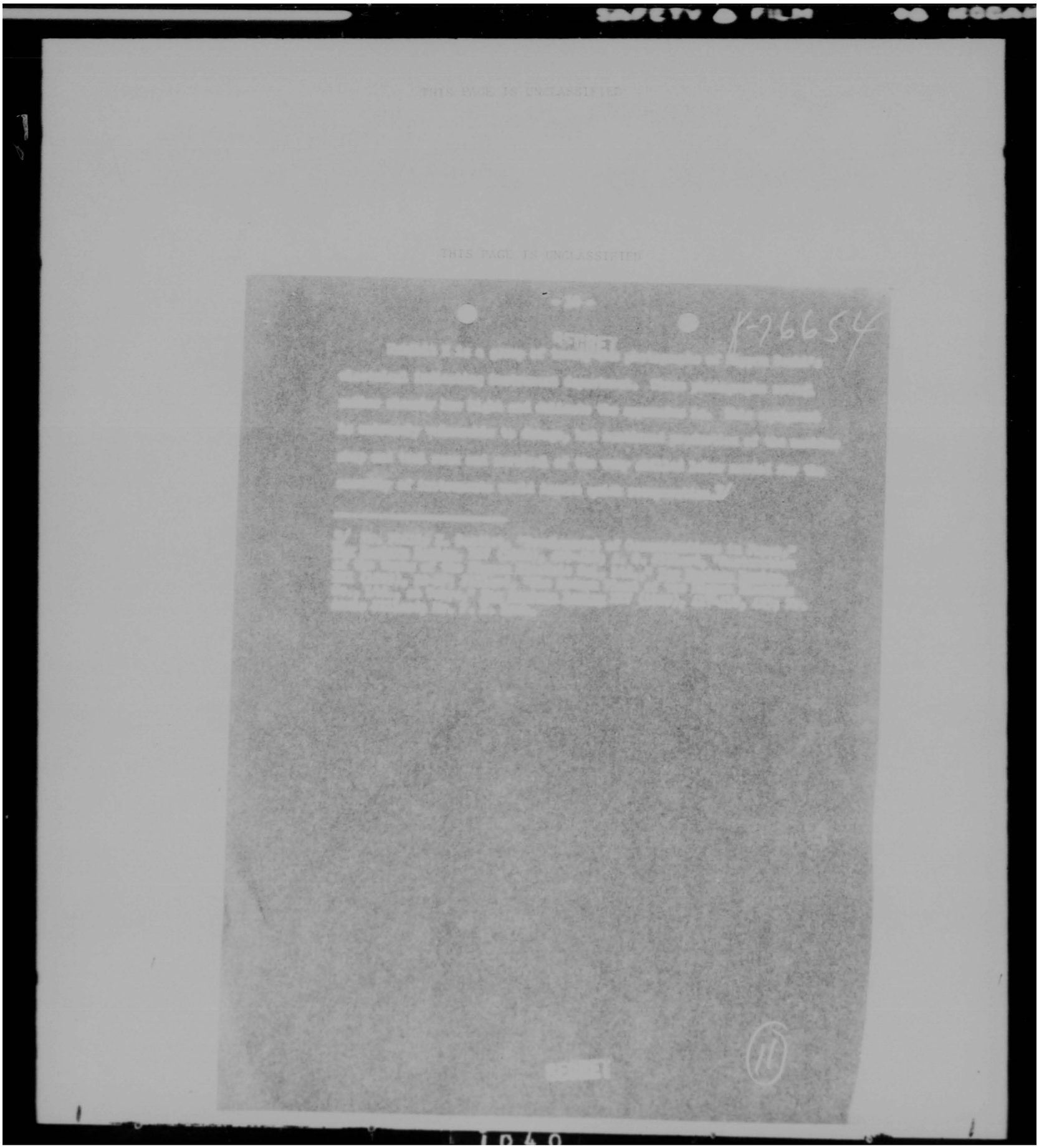
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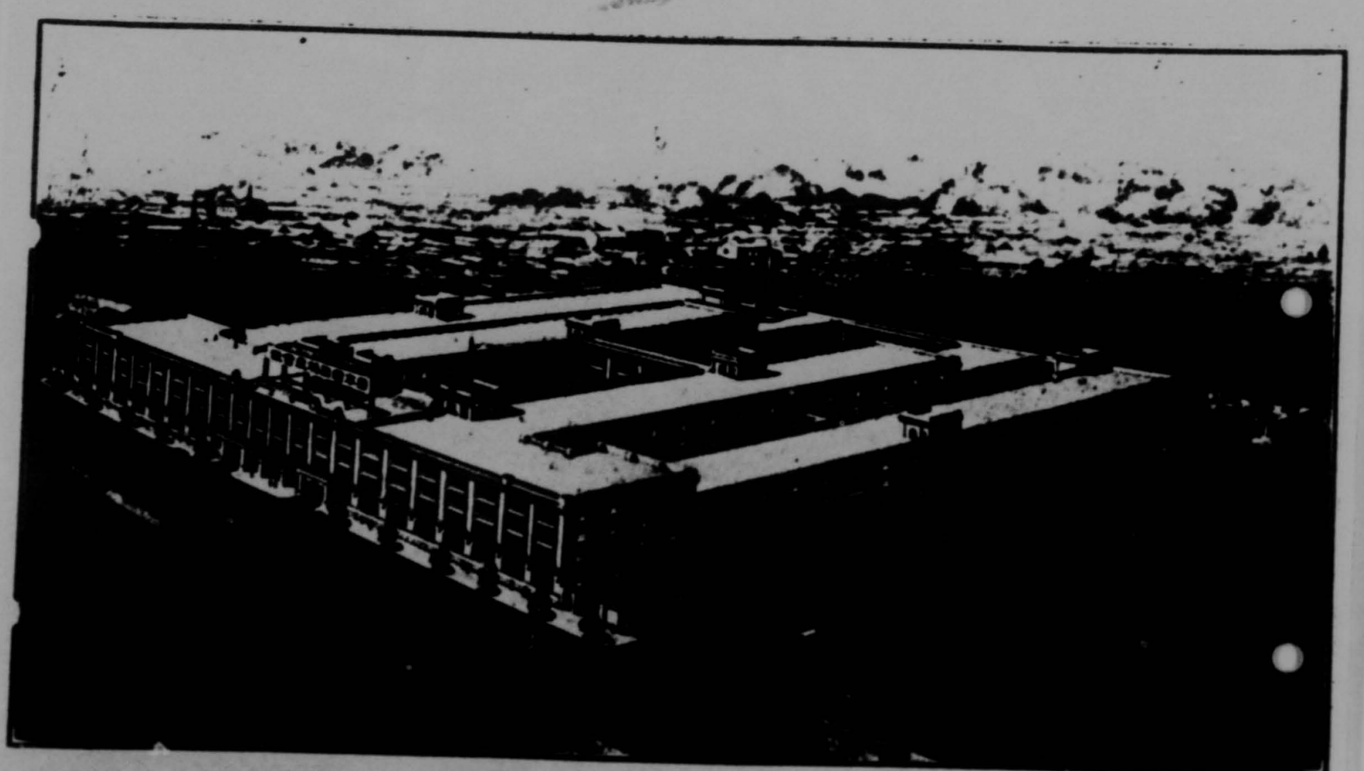


Figure 4—Architect's Drawing of the Ultimate Development of the Main Compound.
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GAS HOLDERS

TOKYO (JAPAN)



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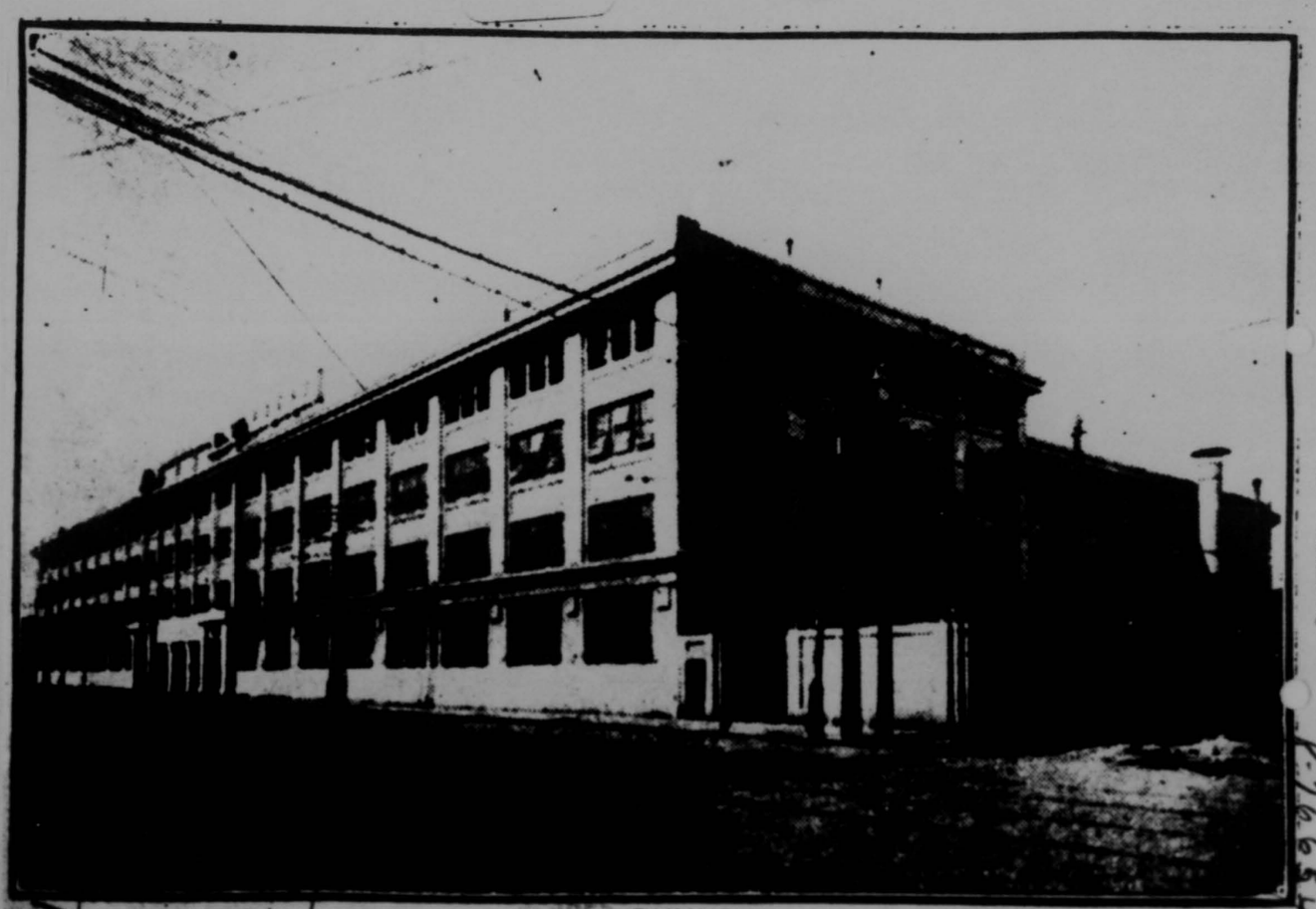
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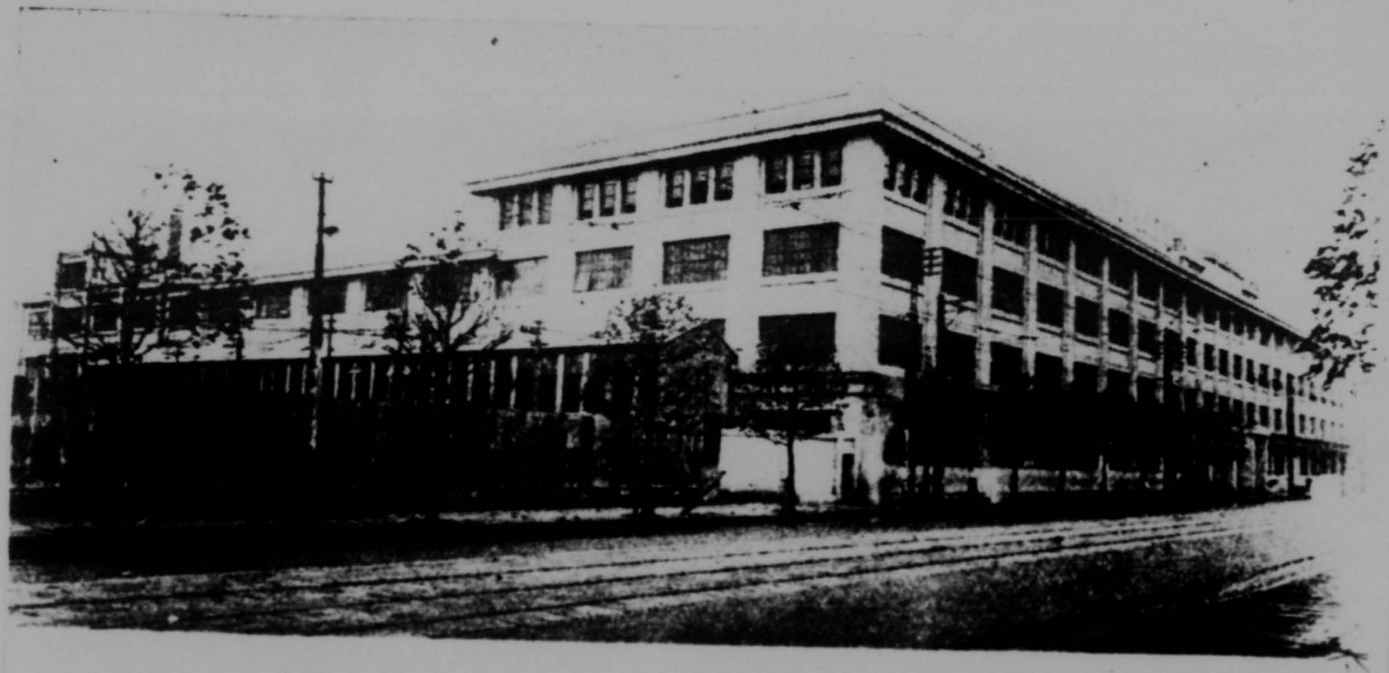
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Nippon Electric Co., Ltd., Mita-Shikokumachi, Tokyo.

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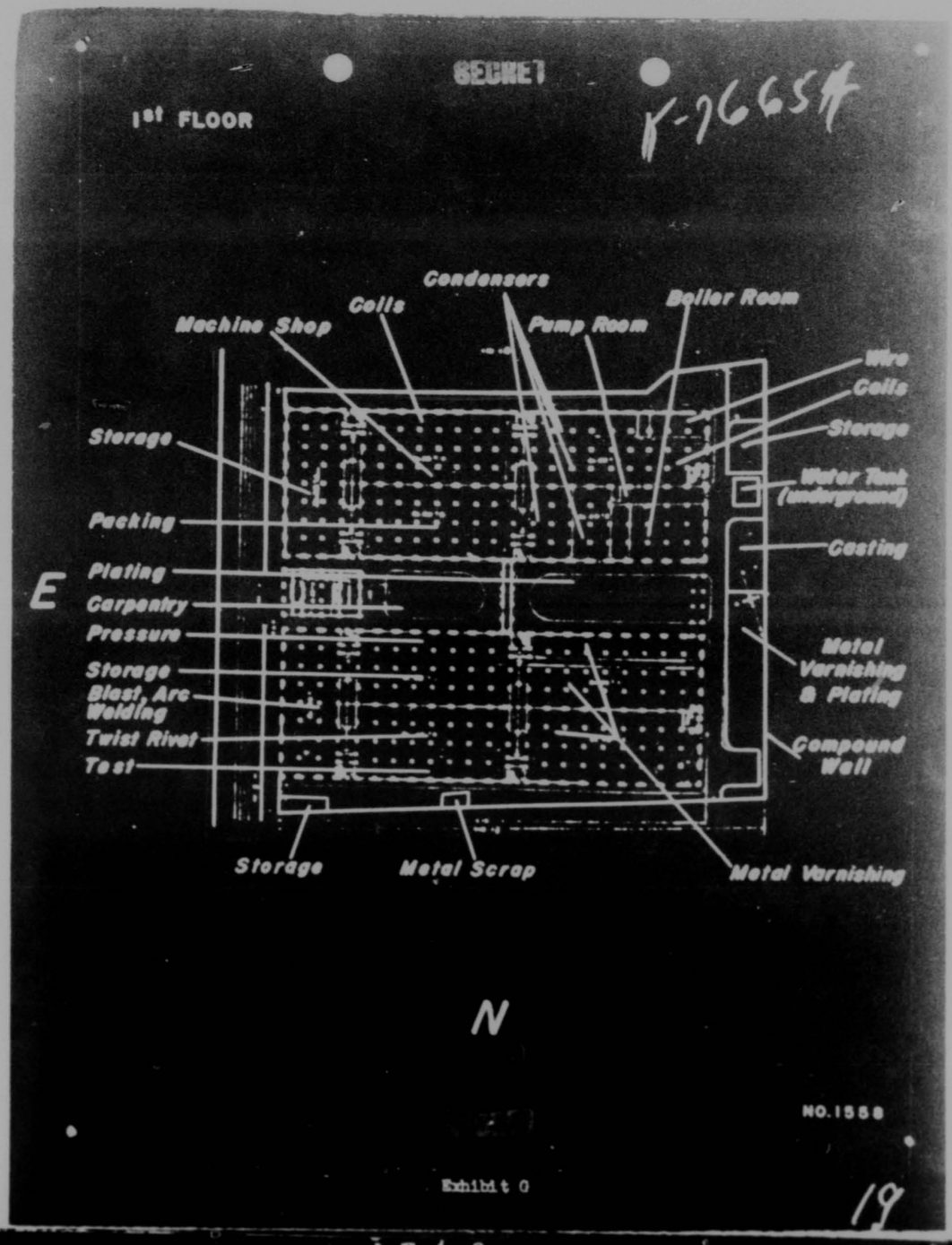
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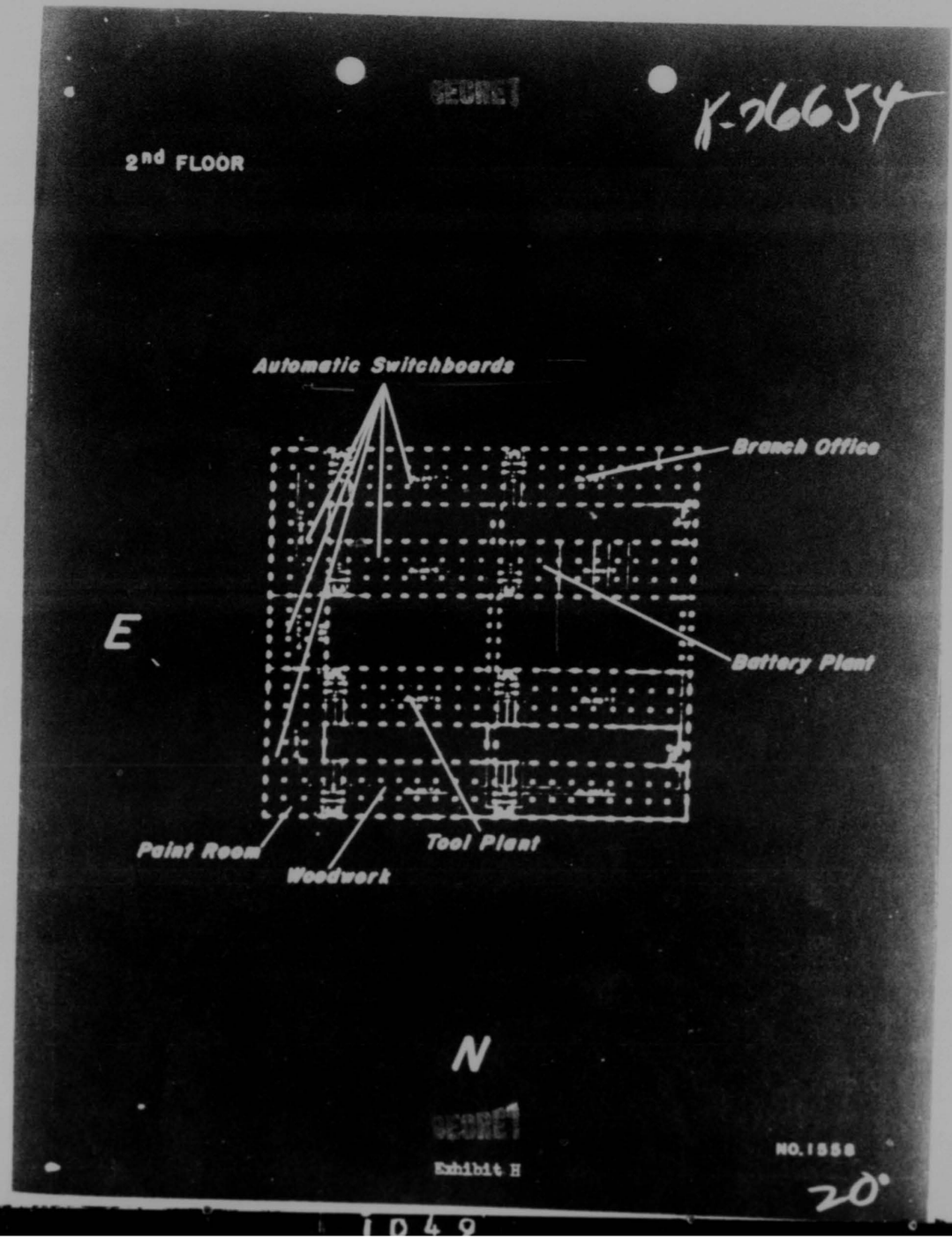
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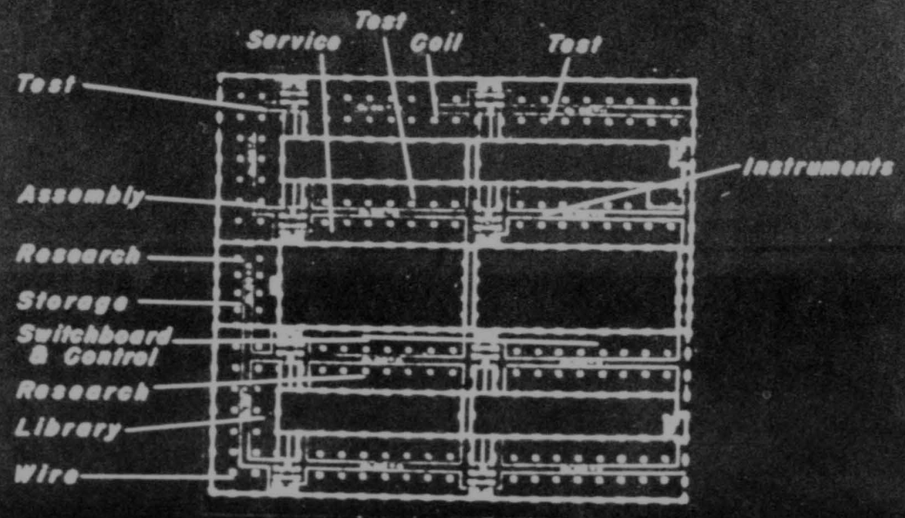
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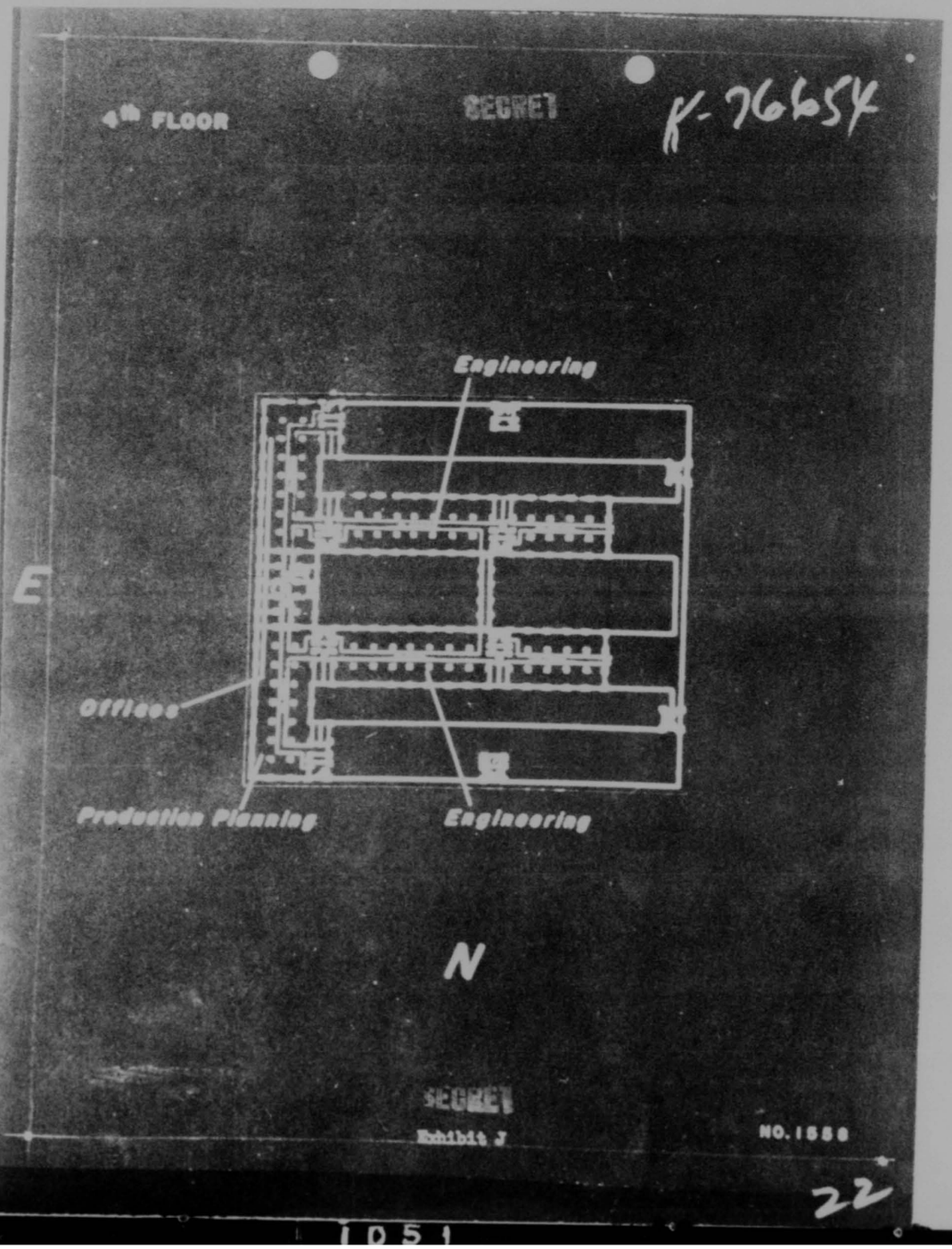
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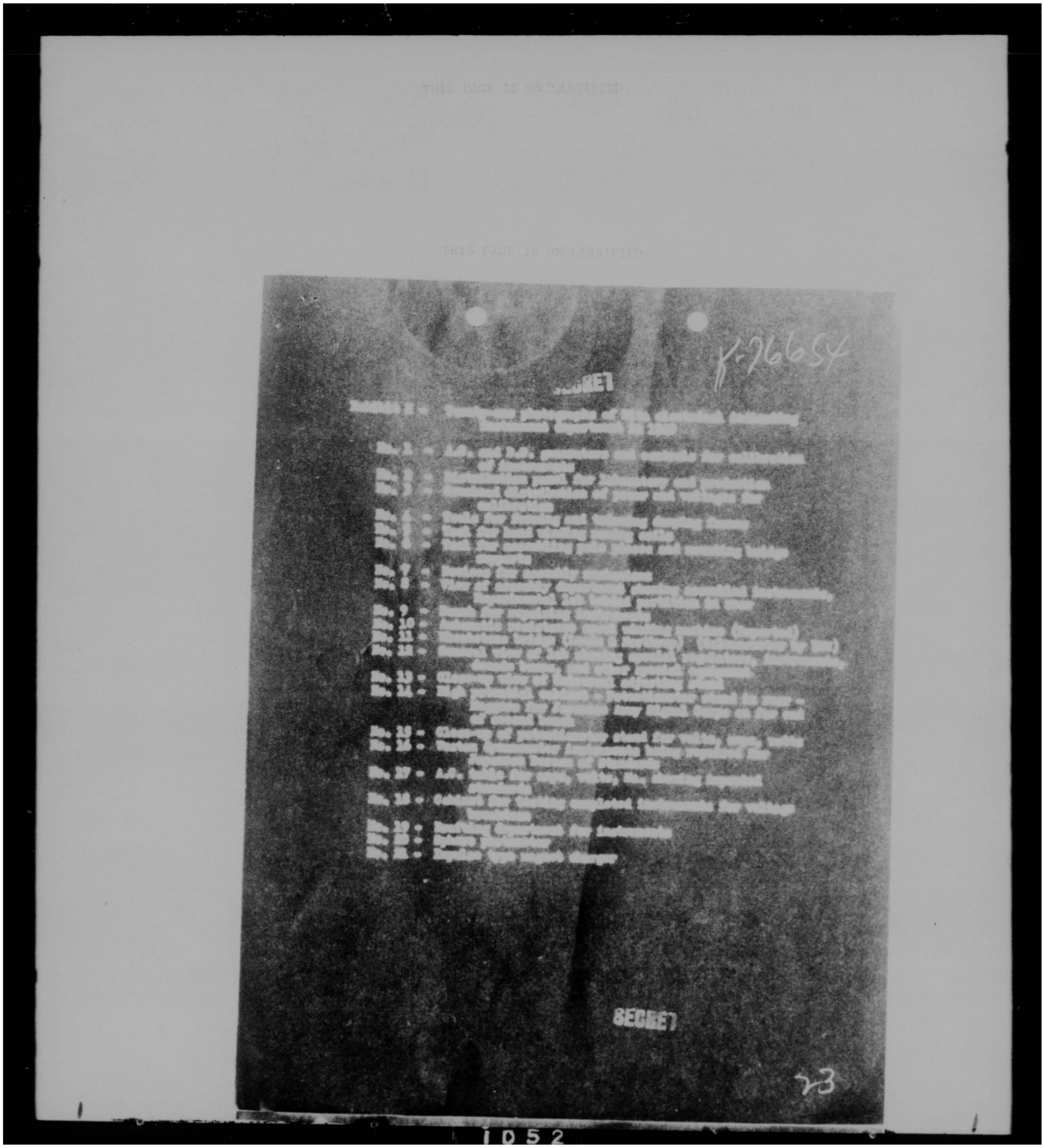
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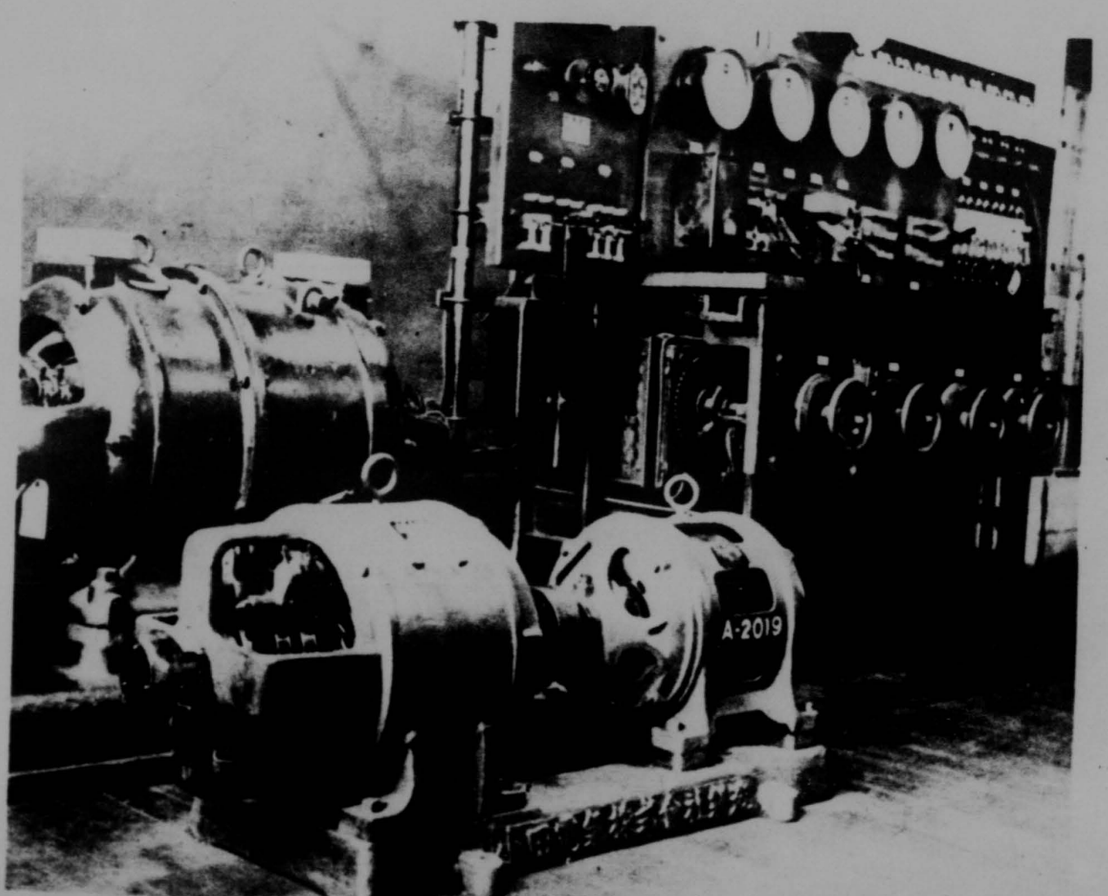


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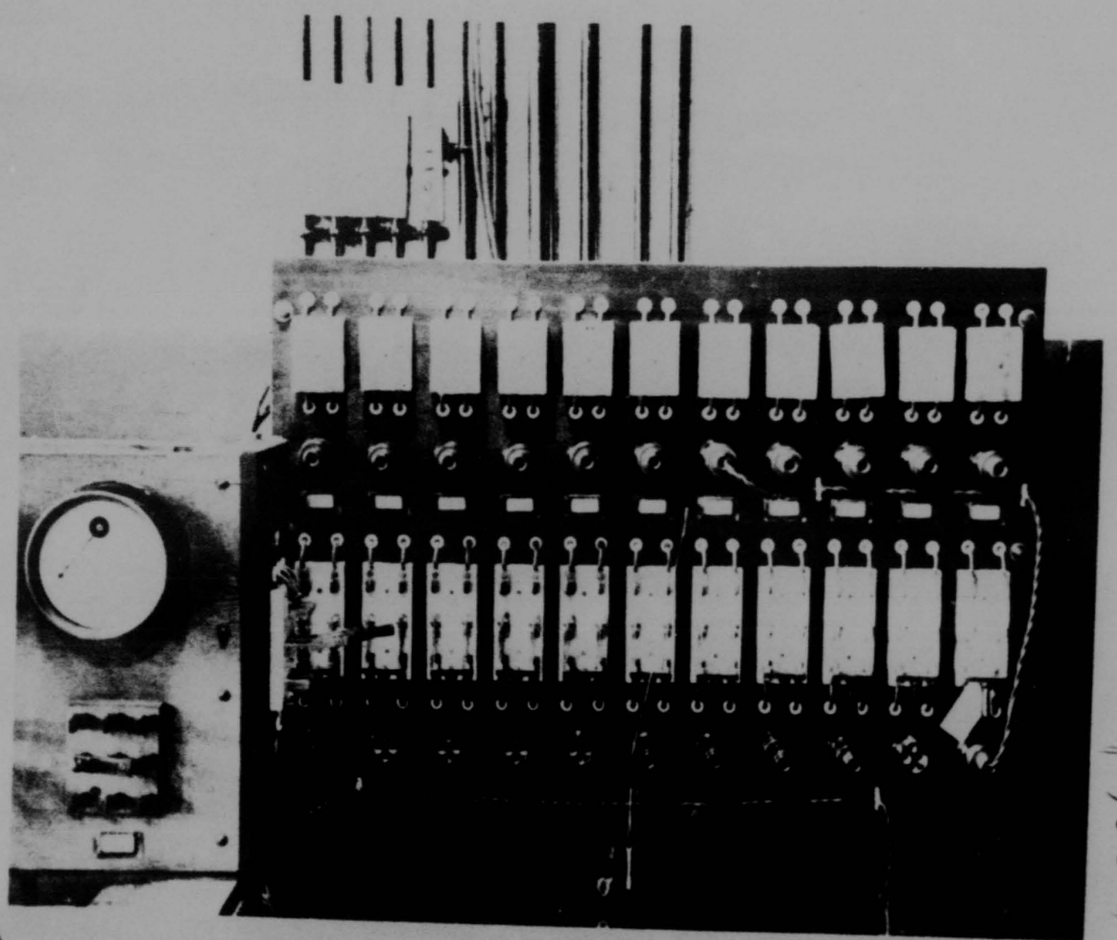


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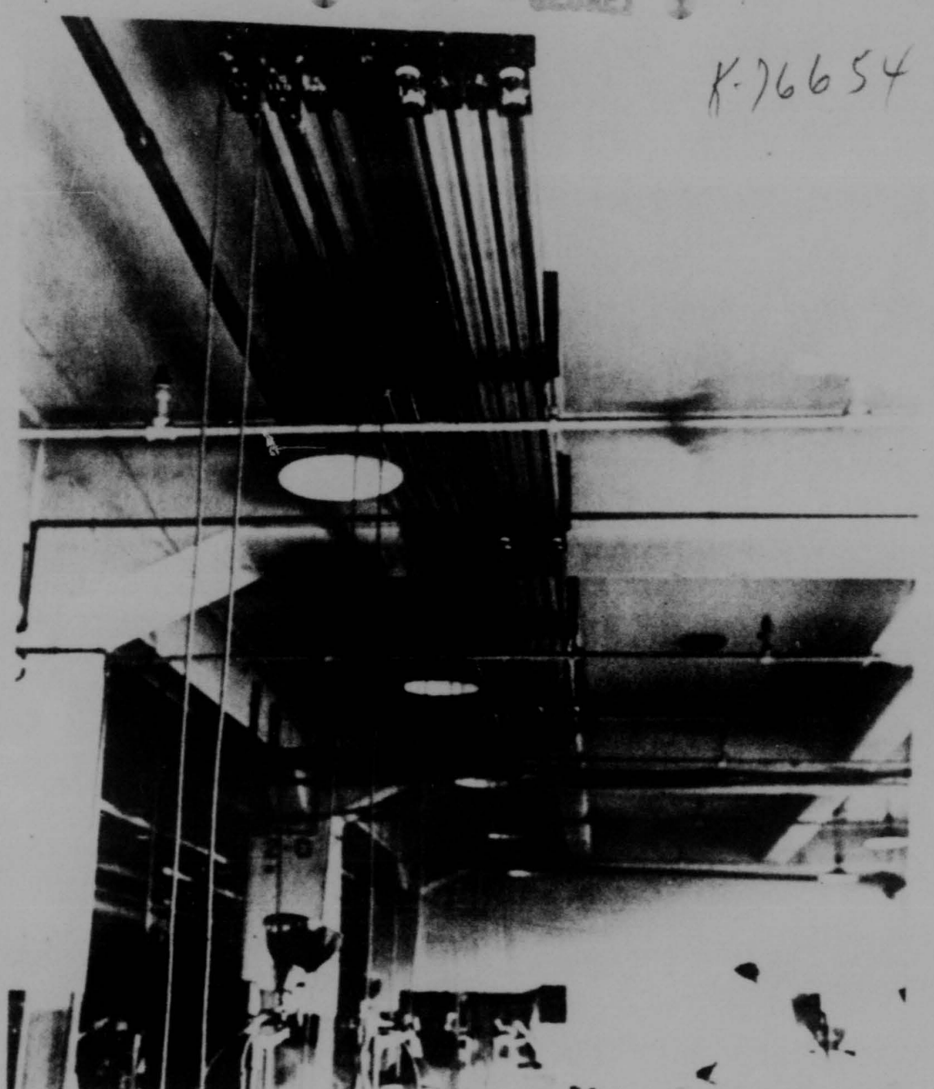


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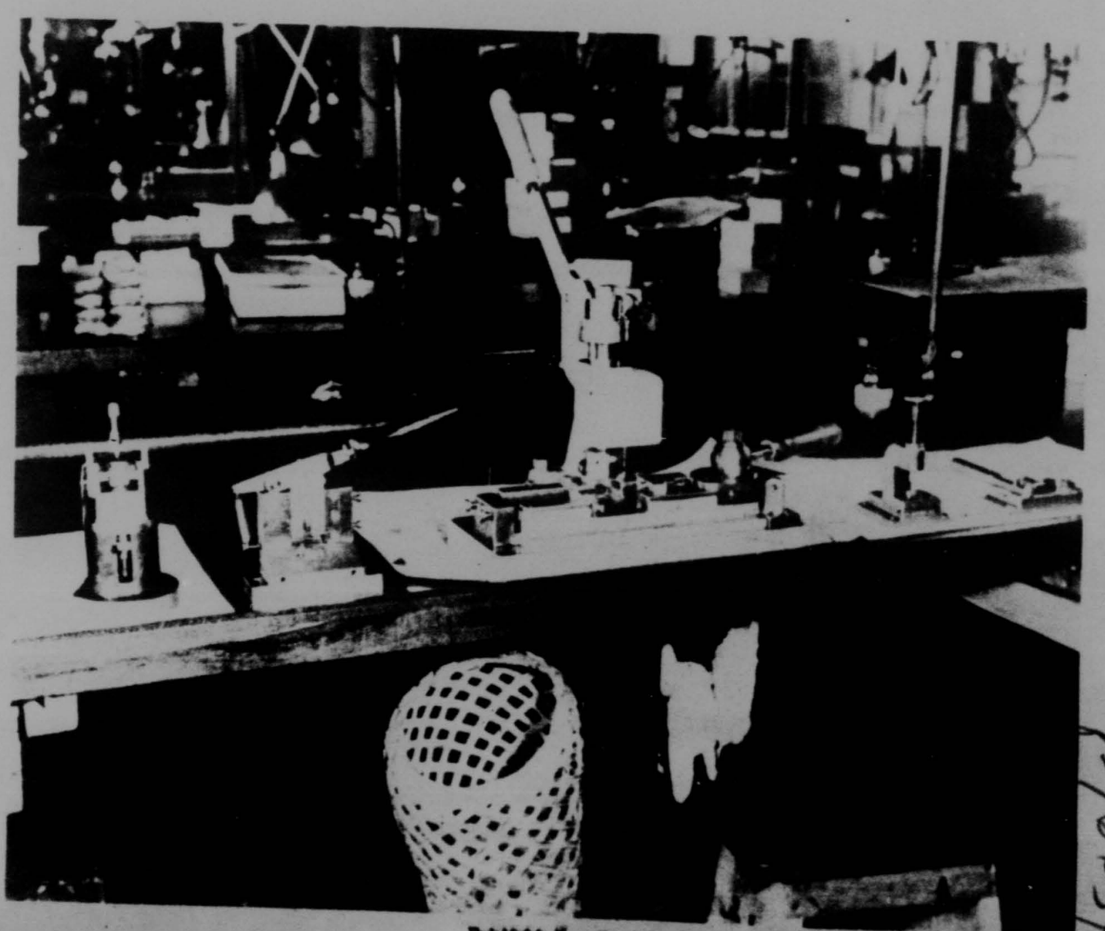


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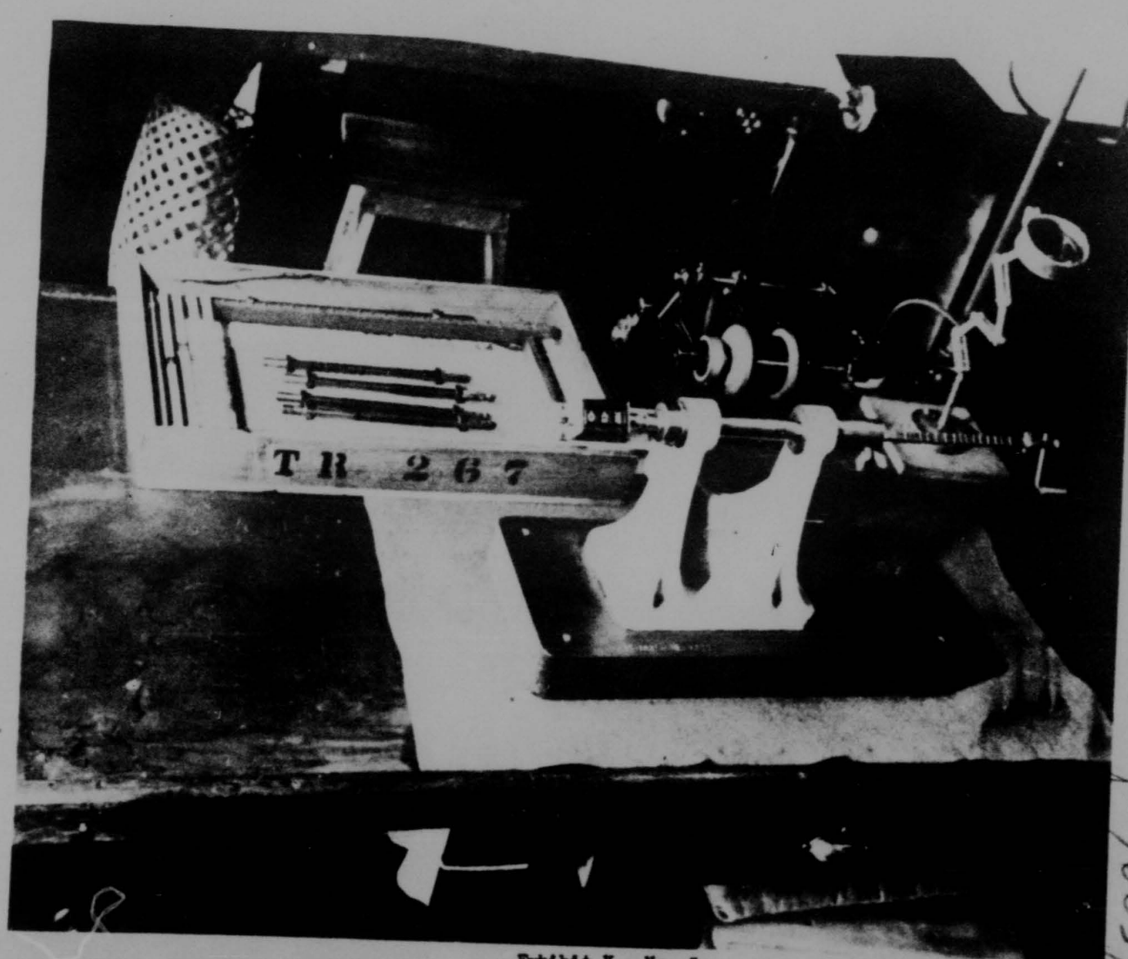


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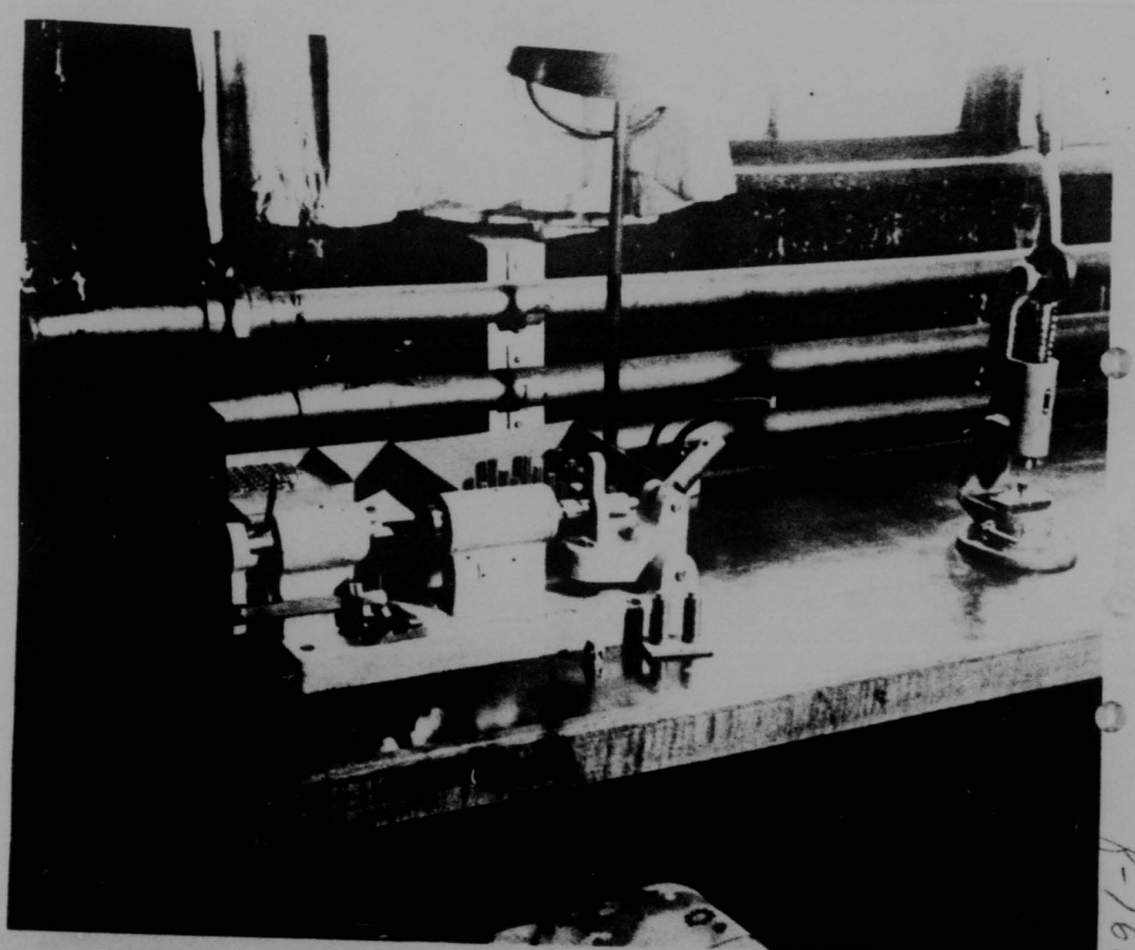


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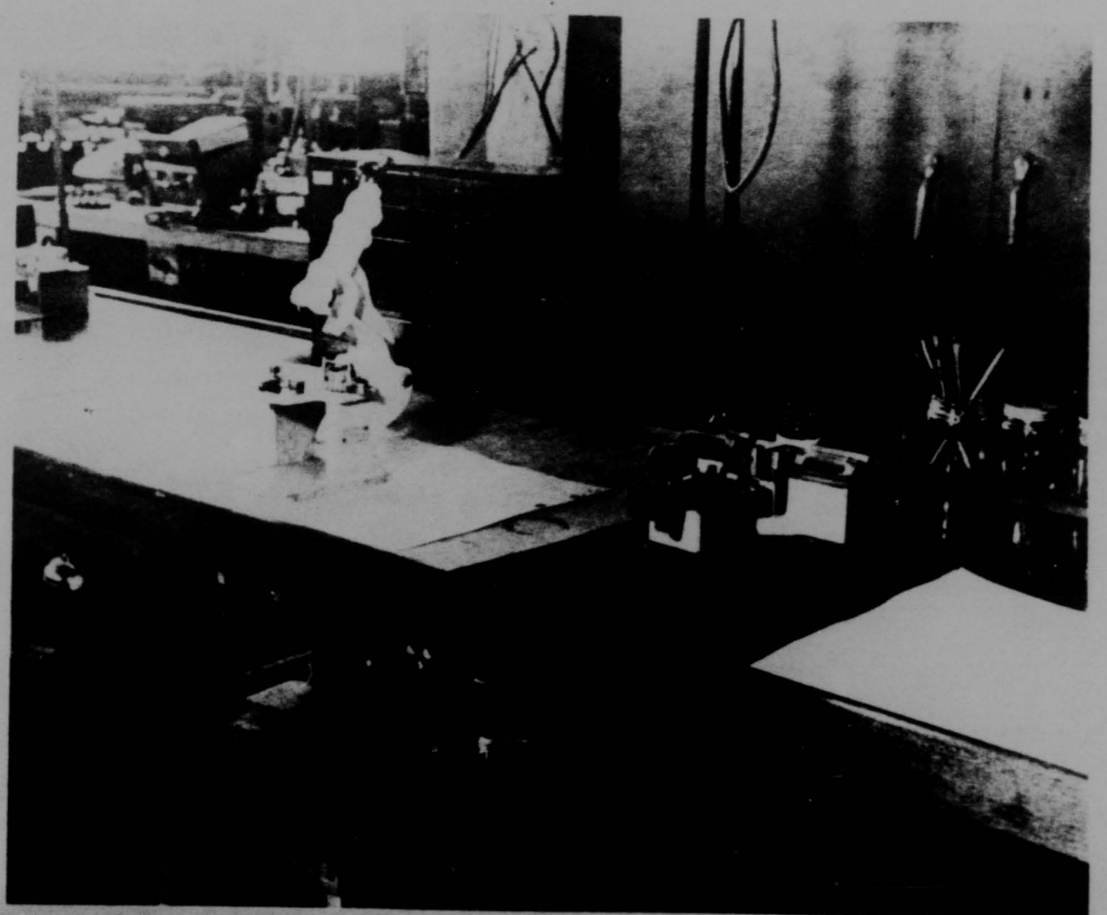


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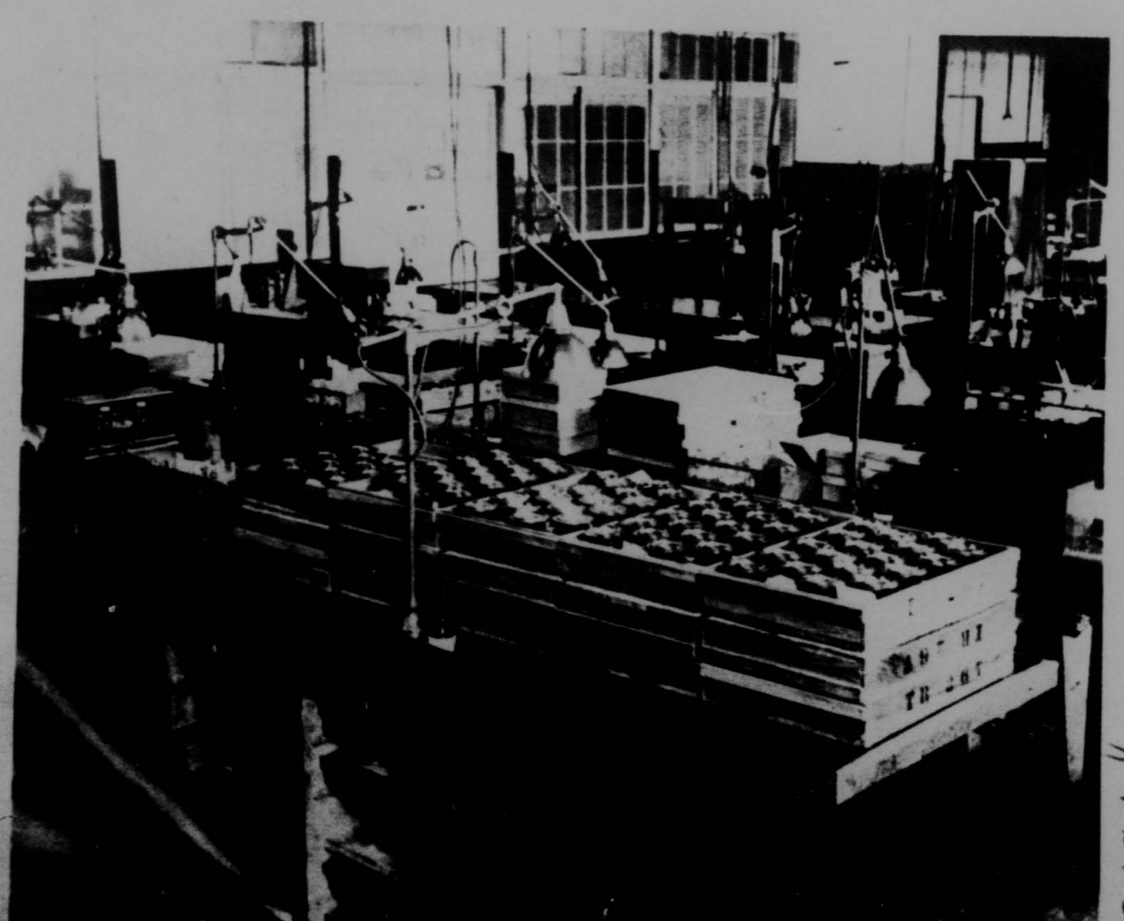


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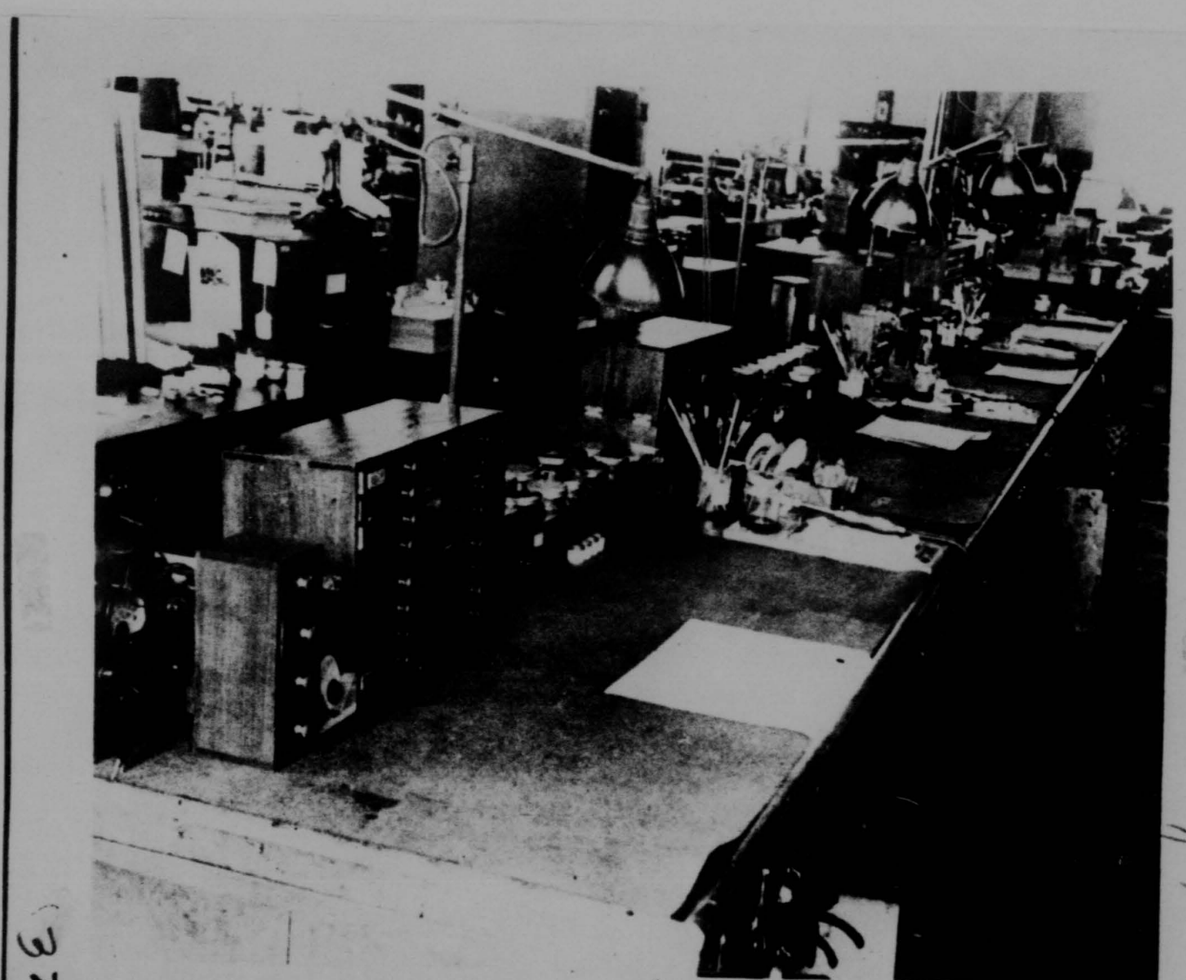


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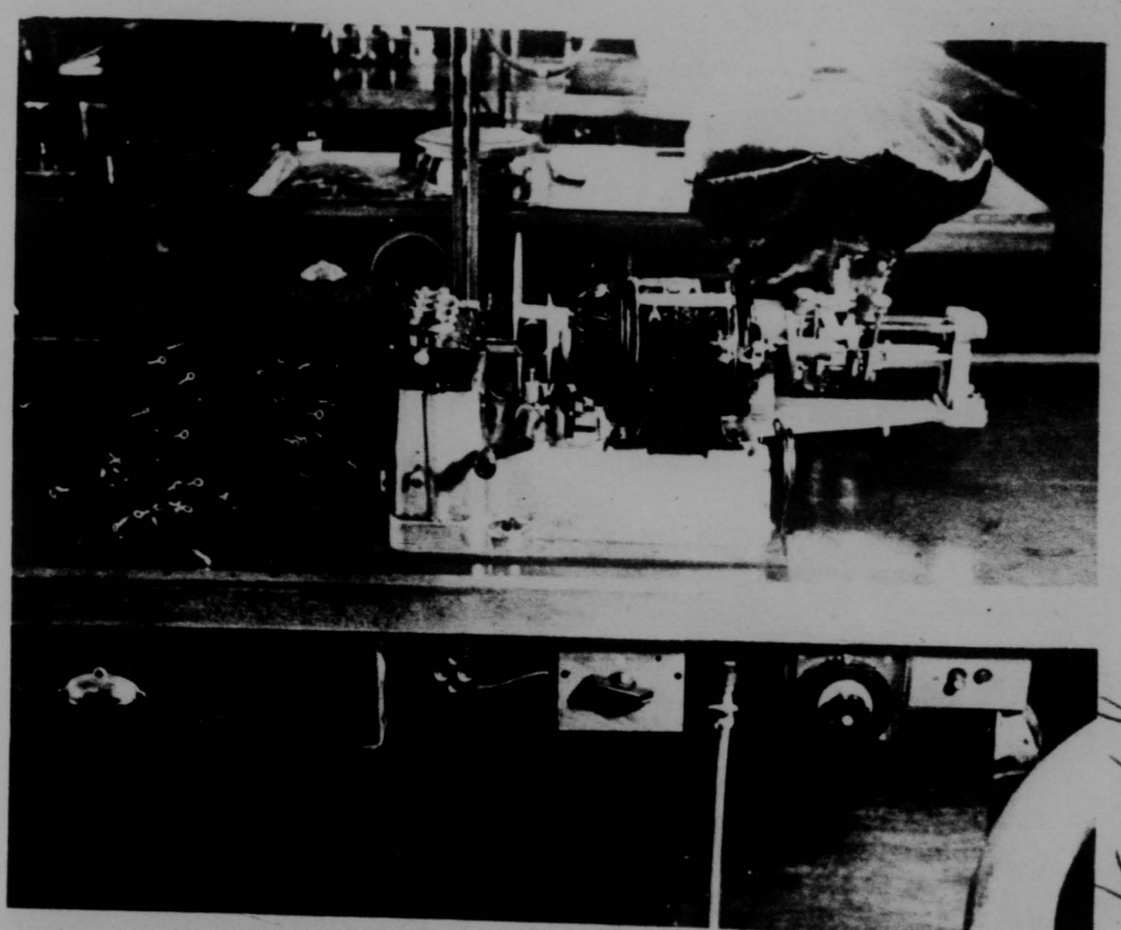


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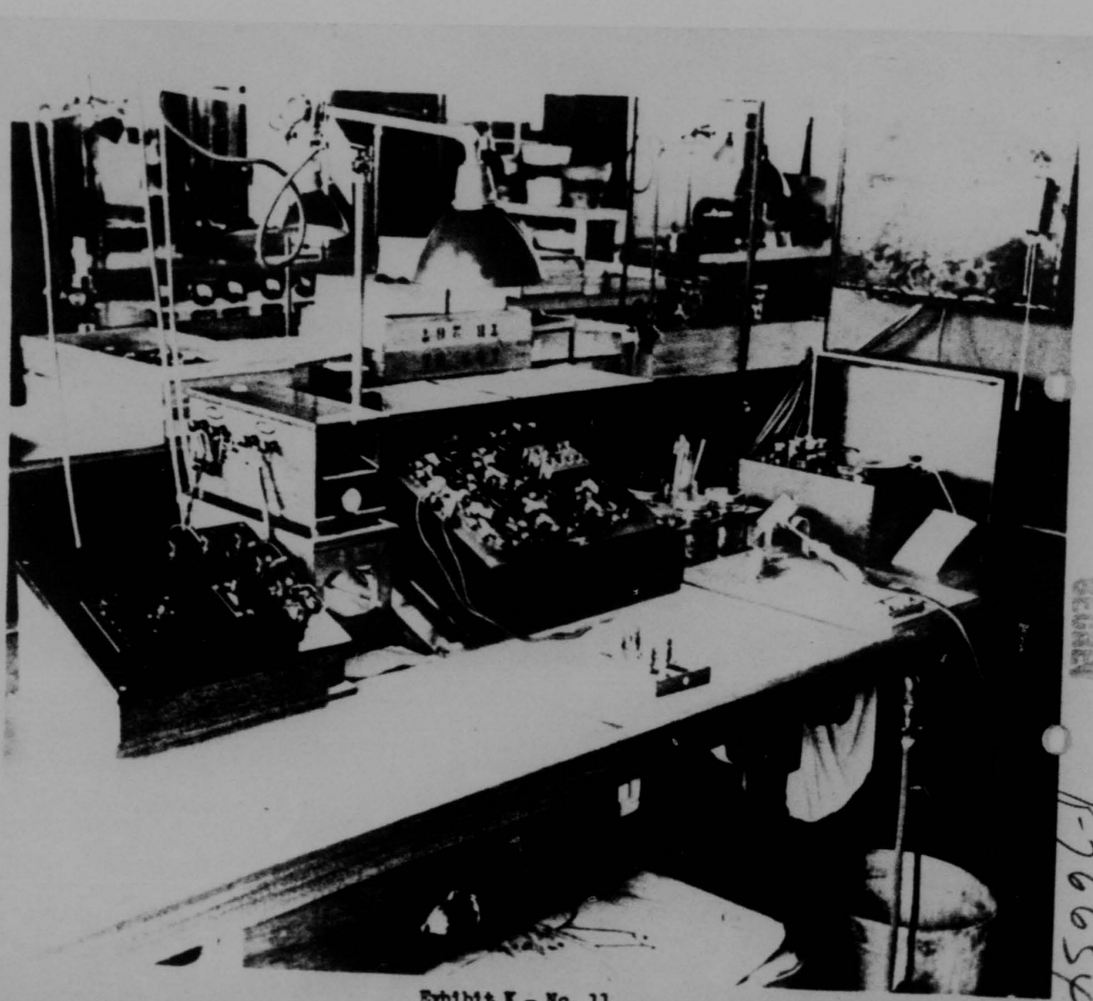


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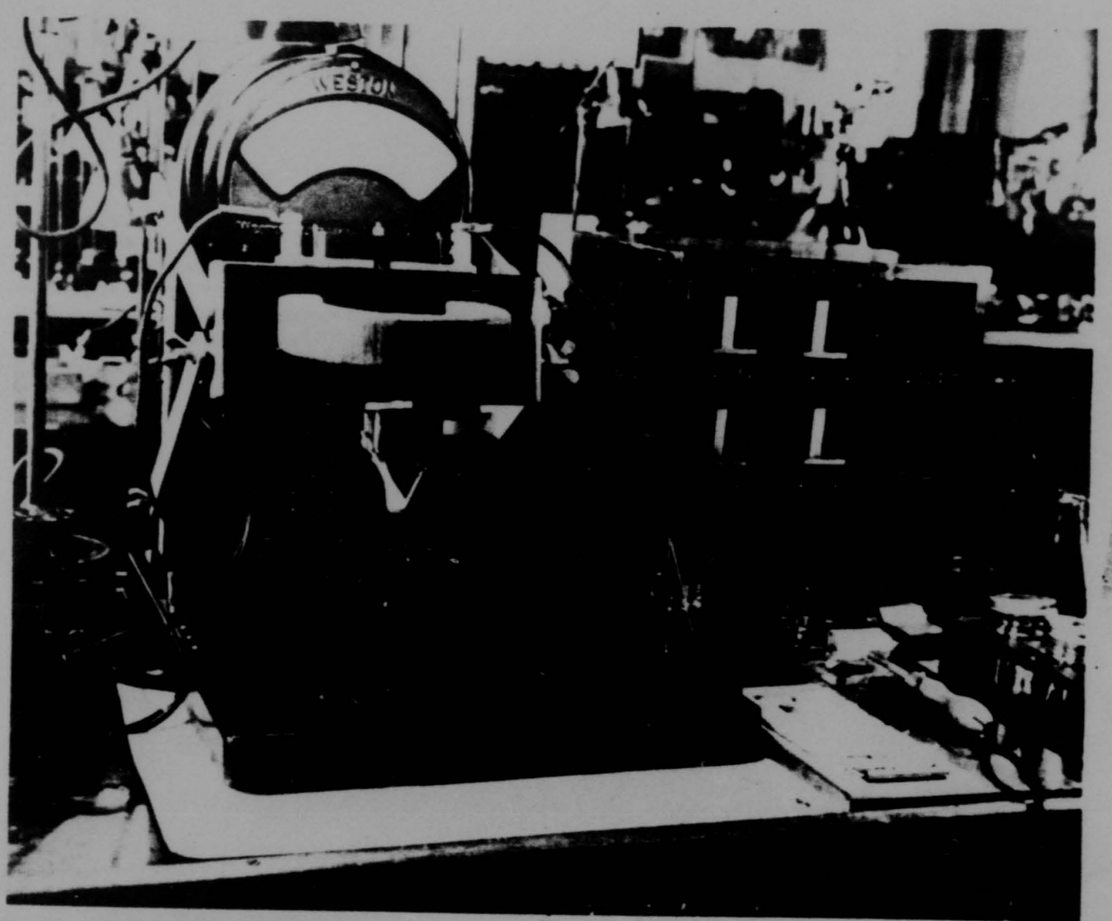


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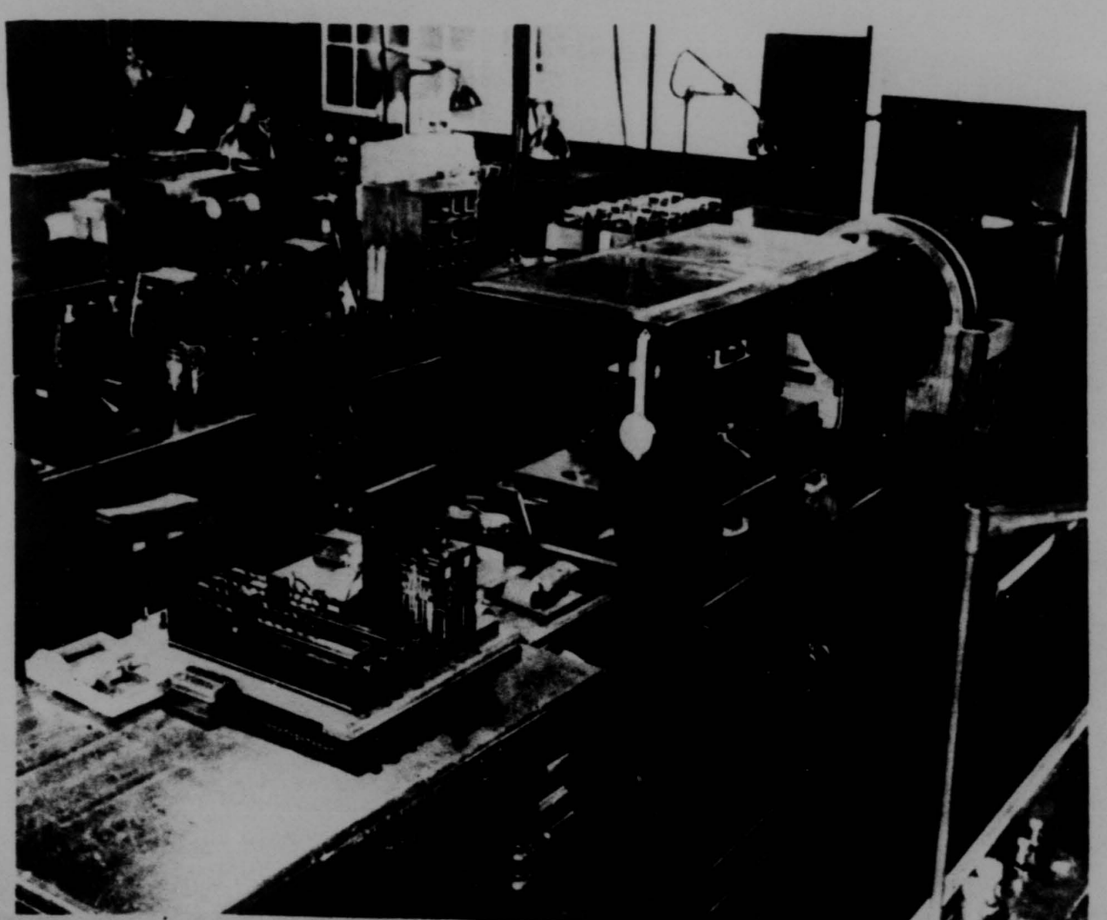


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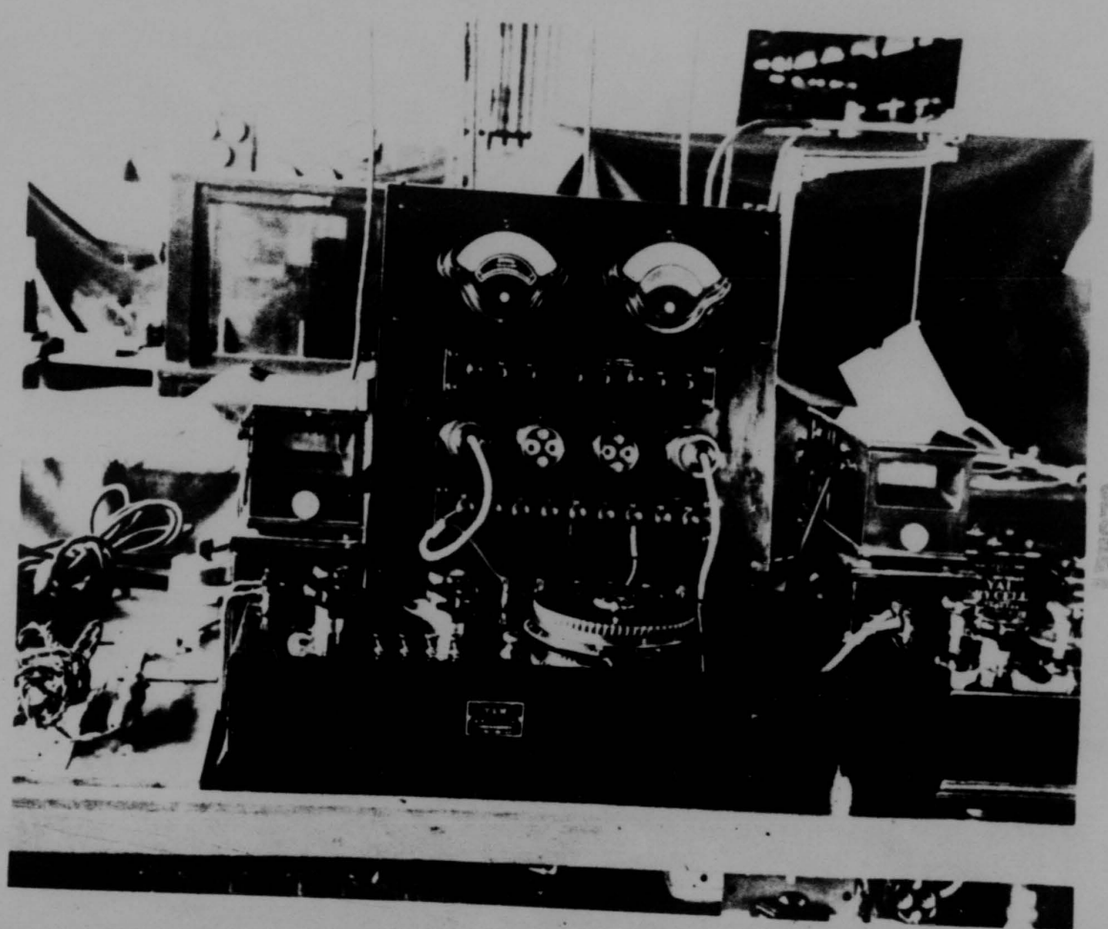


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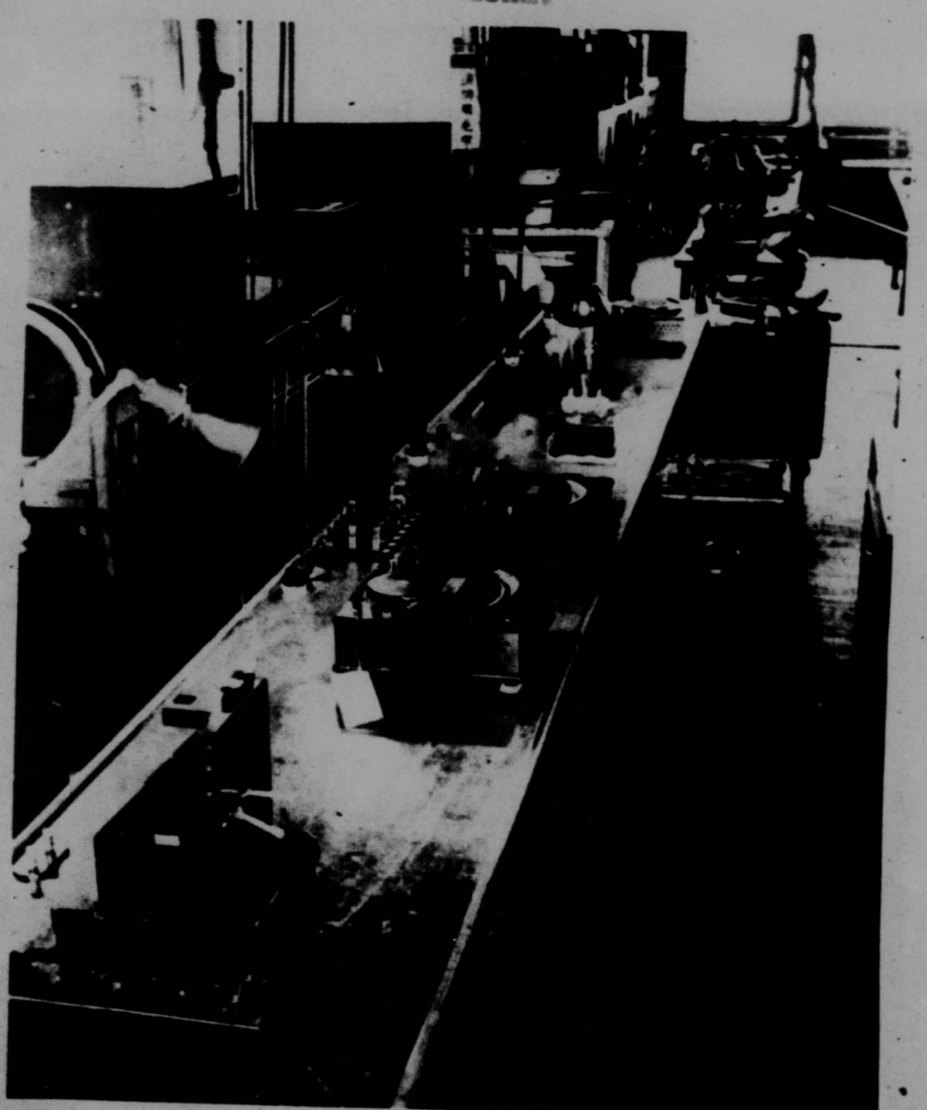


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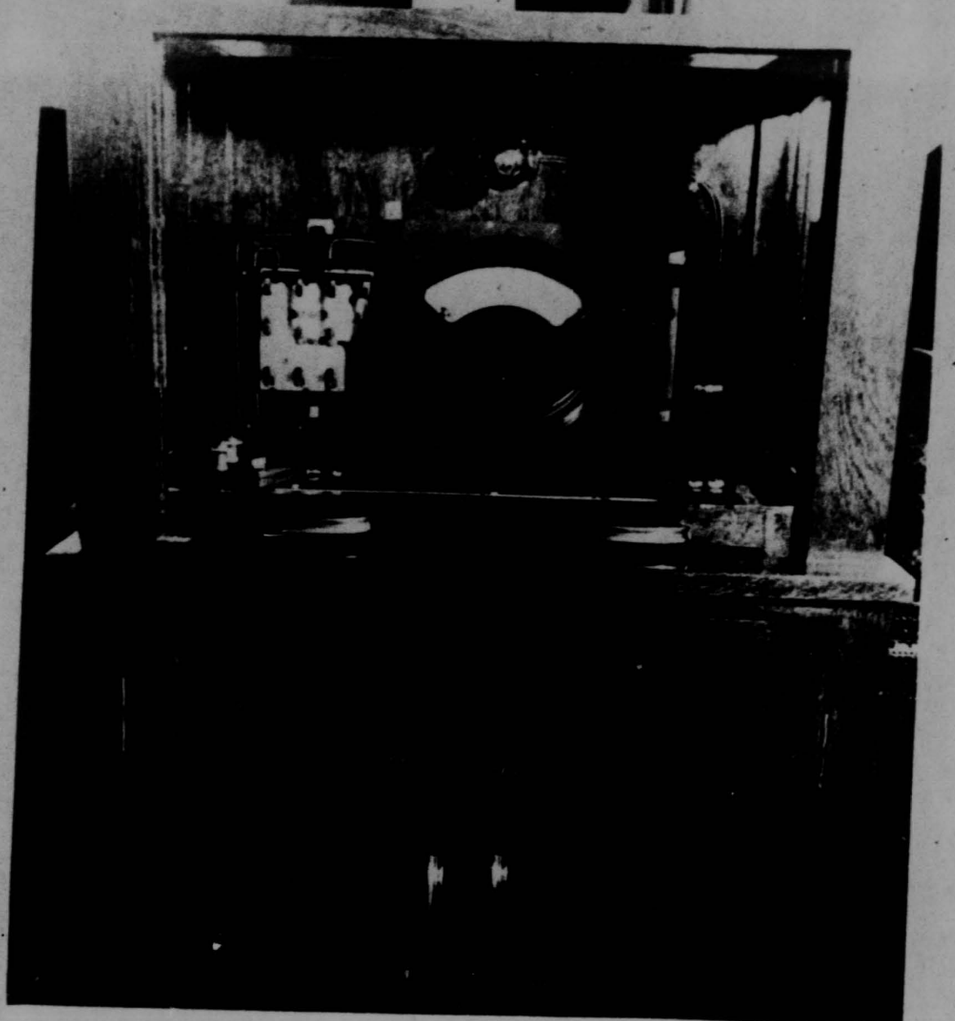


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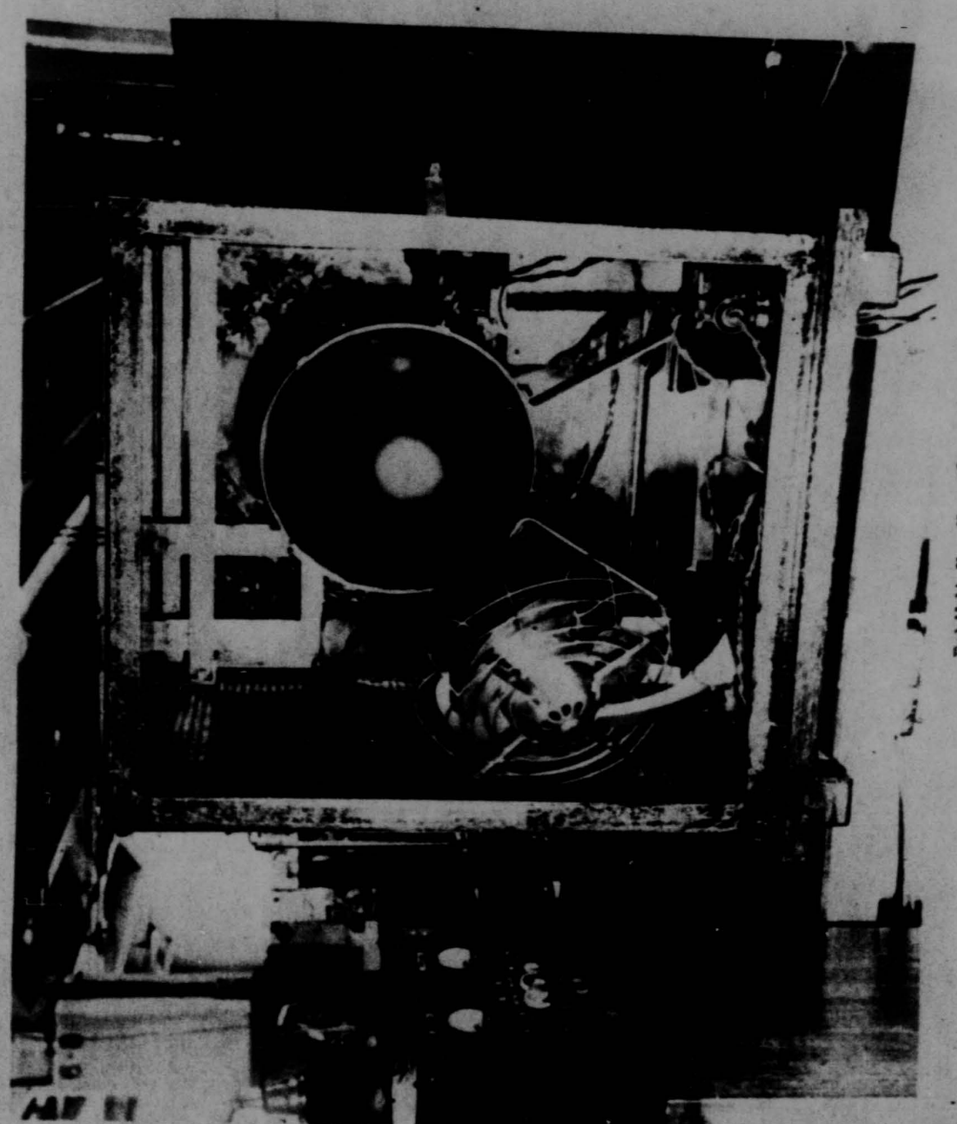


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FAR EAST
KEY PLACE NAMES
AND
AIR OBJECTIVES INDEX

IMPORTANT NOTE

This publication has been classified SECRET when, as a whole, it discloses our overall knowledge and evaluation of Japanese resources and installations. However, the individual target data sheets are classified CONFIDENTIAL following the classification of Air Objective Folders, in which base data appears.

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KEY PLACE NAMES

and

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FAR EAST

KEY PLACE NAMES -- AIR OBJECTIVES INDEX

This reference directory combines a list of principal Far East place names with an index of targets in AAF Air Objective Folders covering the Far East.

The list of place names covers the principal cities/areas under Japanese control, with the exception of certain areas (see map) in which objectives will be primarily tactical. Schedule I lists place names alphabetically, with approximate coordinates for general map reference, and page number reference to Schedule II. Schedule II groups place names in Objective Area sequence, generally indicating the significance of each city/area and showing important objectives (but not all objectives) therein. Important outlying targets are listed under the nearest town or geographical feature.

The index lists targets in Objective Area sequence, and in target-number sequence in each area. Targets are classified according to thirteen major industries/installations. Those not readily classified under one of these headings are identified as to their industry or principal importance. Some targets are listed under more than one classification (for example, under Coke and Iron/Steel).

Targets are not described in detail, such information being available in the corresponding Objective Folders. However, each target has been evaluated as being Primary (P), Secondary (S), or Minor (M), both in regional (immediate area) importance and in relative importance in the overall Japanese war economy. These ratings are to be considered only as a general guide, and not as a final weighted evaluation. Sixty-three (63) targets presently considered to be of key importance are identified by *. It will be noted that these key targets include certain electric power plants, on the basis of peculiar importance in connection with other industries. All of these ratings are subject to change on the basis of additional intelligence and the course of the war.

In general, direct military installations and primarily tactical objectives are not listed. Airfields are a special category of targets, subject to considerable change in characteristics and importance, and only those with major fixed installations are included. The index excludes some minor targets in earlier Objective Folders and includes a number of new targets listed in current revisions of Objective Folders on Japan Proper, Manchuria, and Korea.

This reference directory has been compiled from the Air Objective Folders issued by the Office of the Assistant Chief of Air Staff, Intelligence, to which reference should be made for further details and for information on less important objectives not listed herein.

As revisions to existing targets and information on additional targets is prepared, this intelligence will be forwarded on loose-leaf punched sheets for insertion in the reference directory.

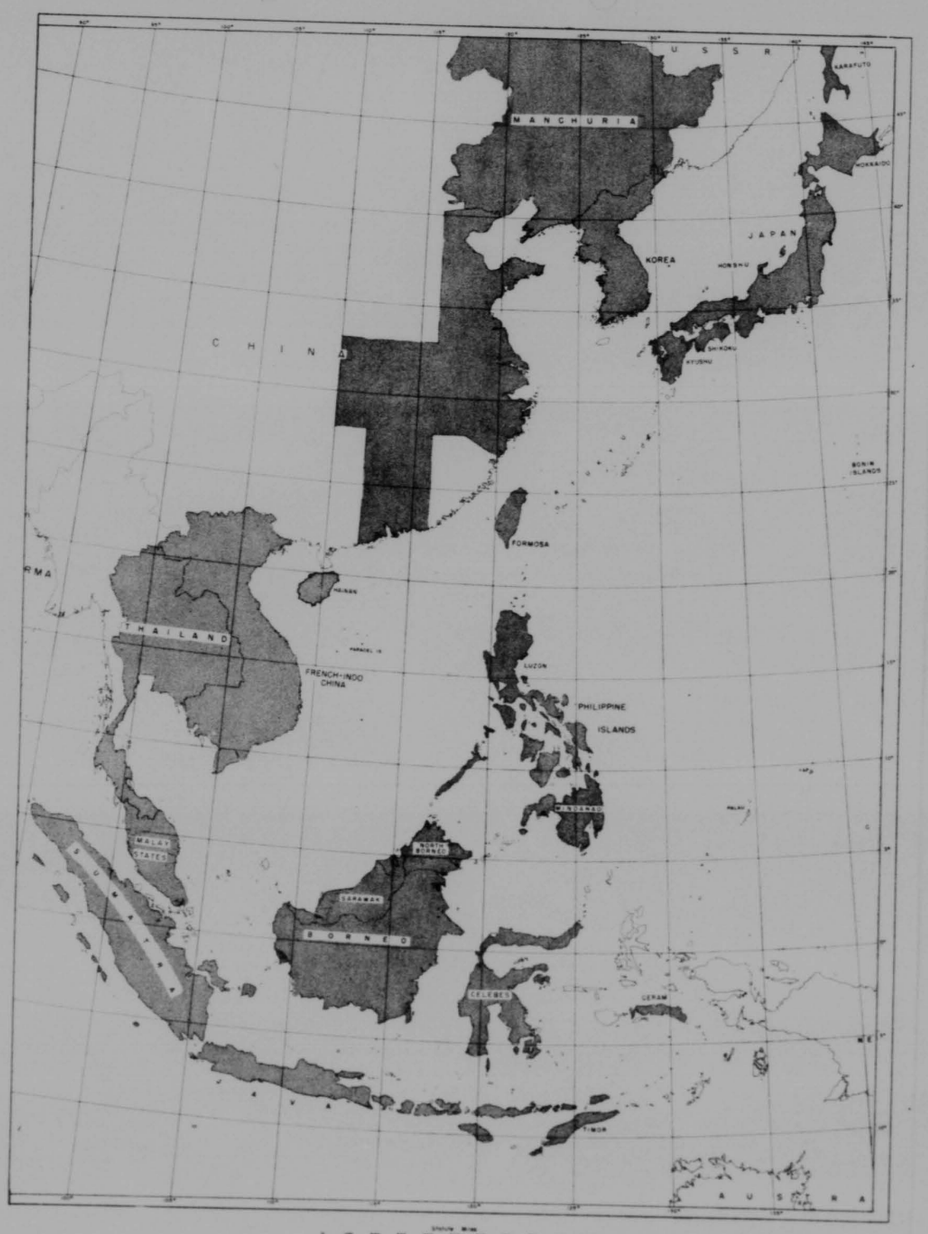
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THE SHADED PORTIONS OF THIS MAP INDICATE THE AREAS COVERED IN THE INDEX.

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SCHEDULE I

KEY PLACE NAMES - FAR EAST

(Listed Alphabetically)

Place	Approximate Coordinates	Reference Page In Schedule II
Akashi, Japan	34 38 N - 135 00 E	5
Akita, Japan	39 41 N - 140 07 E	1
Amagasaki, Japan	34 42 N - 135 25 E	5
Amoy, China	24 27 N - 118 04 E	12
Anshan, Manchuria	41 05 N - 122 58 E	11
Aomori, Japan	40 47 N - 140 44 E	1
Balikpapan, Borneo	01 16 S - 116 49 E	18
Bandung, Java	06 55 S - 107 36 E	17
Bangkok, Thailand	13 46 N - 100 29 E	15
Ban Pachi, Thailand	14 27 N - 100 44 E	15
Batavia, Java	06 12 S - 106 51 E	17
Batu Pahat, Malaya	01 52 N - 102 55 E	16
Belawan, Sumatra	03 47 N - 98 41 E	16
Bintan Is., Sumatra	00 50 N - 104 36 E	16
Boela, Ceram Is.	03 00 S - 126 40 E	18
Buitenzorg, Sumatra	06 35 S - 106 47 E	17
Calambayanga, Philippines	14 19 N - 122 39 E	18
Campha, Fr. Indo-China	21 01 N - 107 22 E	13
Cam Ranh Bay, Fr. Indo-China	11 55 N - 109 10 E	14
Canton, China	23 11 N - 113 14 E	12
Cap St. Jacques, Fr. Indo-China	10 21 N - 107 06 E	14
Cavite, Philippines	14 29 N - 120 54 E	18
Cebu, Philippines	10 18 N - 123 54 E	18
Chofu, Japan	34 00 N - 131 00 E	8
Chinkai, Korea	35 07 N - 128 41 E	10
Chinnampo, Korea	38 48 N - 125 25 E	10
Chinwangtao, China	39 56 N - 119 38 E	12
Dairen, Manchuria	38 55 N - 121 38 E	11
Davao, Philippines	07 04 N - 125 36 E	18

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Schedule I

Place	Approximate Coordinates	Reference Page In Schedule II
Dilli, Timor	08 34 S - 125 37 E	18
Emma Haven, Sumatra	01 00 S - 100 22 E	17
Endau, Malaya	02 40 N - 103 38 E	15
Foochow, China	26 04 N - 119 19 E	12
Fukae, Japan	34 43 N - 135 17 E	5
Fukuoka, Japan	33 34 N - 130 23 E	8
Fusan, Korea	35 06 N - 140 08 E	10
Fushun, Manchuria	41 51 N - 123 54 E	11
Genzan, Korea	39 10 N - 127 26 E	10
Gunzan, Korea	35 59 N - 126 44 E	10
Habu, Japan	34 16 N - 133 11 E	6
Hachinoke, Japan	40 31 N - 141 31 E	1
Haiphong, Fr. Indo-China	20 52 N - 106 40 E	13
Hakodate, Japan	41 42 N - 140 44 E	1
Hamamatsu, Japan	34 42 N - 137 42 E	4
Handa, Japan	34 53 N - 136 57 E	4
Hankow, China	30 36 N - 114 20 E	12
Hanoi, Fr. Indo-China	21 02 N - 105 51 E	13
Harbin, Manchuria	45 49 N - 126 52 E	11
Heijo, Korea	39 00 N - 125 45 E	10
Heito, Formosa	22 42 N - 120 30 E	15
Hiko Island, Japan	33 56 N - 130 56 E	8
Himeji, Japan	34 49 N - 134 43 E	6
Hirakata, Japan	34 50 N - 135 40 E	5
Hirohata, Japan	34 47 N - 134 38 E	6
Hiroshima, Japan	34 24 N - 132 25 E	6
Hoihow, Hainan Is.	20 02 N - 110 16 E	13
Hongay, Fr. Indo-China	20 57 N - 107 05 E	13
Hong Kong (Kowloon), China	22 12 N - 114 12 E	12
Hulutao, Manchuria	40 44 N - 121 01 E	11
Iloilo, Philippines	10 42 N - 122 34 E	18
Ishikara River Basin, Japan	43 29 N - 141 55 E	1

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Place	Approximate Coordinates	Reference Page In Schedule II
Jinsen, Korea	37 27 N - 126 36 E	10
Kagamigahara, Japan	35 23 N - 136 51 E	4
Kagoshima, Japan	31 40 N - 130 34 E	9
Kamaishi, Japan	39 15 N - 141 55 E	2
Kambara, Japan	35 05 N - 138 36 E	3
Kanose, Japan	37 42 N - 139 28 E	2
Karatsu, Japan	33 27 N - 129 57 E	9
Karenko, Formosa	23 58 N - 121 36 E	14
Kariya, Japan	34 59 N - 137 00 E	4
Kosaka, Japan	40 19 N - 140 45 E	2
Kasumigaura, Japan	36 03 N - 140 22 E	2
Kawasaki, Japan	35 29 N - 139 42 E	3
Keelung (Kiirun), Formosa	25 08 N - 121 44 E	14
Keijo, Korea	37 32 N - 126 57 E	10
Kemaman, Malaya	04 15 N - 103 26 E	15
Kenjiho, Korea	38 46 N - 125 37 E	10
Kinkaseki, Formosa	25 06 N - 121 51 E	14
Kinsui, Formosa	24 37 N - 120 53 E	14
Kirin, Manchuria	37 50 N - 125 00 E	11
Kobe, Japan	34 40 N - 135 11 E	5
Kochi, Japan	33 32 N - 133 31 E	7
Koepang, Timor	10 10 S - 123 35 E	18
Koizumi, Japan	36 15 N - 139 25 E	2
Kokura, Japan	33 52 N - 130 52 E	8
Kolaka, Celebes	04 03 S - 121 25 E	17
Konan, Korea	39 52 N - 127 33 E	10
Korat, Thailand	14 58 N - 102 05 E	15
Koromo, Japan	35 04 N - 137 10 E	4
Kota Bahru, Malaya	06 09 N - 102 14 E	15
Kuala Dungun, Malaya	04 47 N - 103 26 E	15
Kuala Lumpur, Malaya	03 08 N - 101 41 E	16
Kudamatsu, Japan	34 00 N - 131 53 E	6

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Place	Approximate Coordinates	Reference Page In Schedule II
Kumamoto, Japan	32 47 N - 130 43 E	9
Kure, Japan	34 13 N - 132 32 E	6
Kurosawajiri, Japan	38 18 N - 141 07 E	2
Kurume, Japan	33 18 N - 130 30 E	8
Kushiro, Japan	42 58 N - 144 23 E	1
Kuwana, Japan	35 04 N - 136 41 E	4
Kyoto, Japan	34 58 N - 135 45 E	4
Lake Jitsugetsutan, Formosa	23 52 N - 120 55 E	14
Laoyao, China	34 44 N - 119 27 E	12
Legaspi, Philippines	13 09 N - 123 45 E	19
Linsi, China	39 42 N - 118 26 E	13
Lutong, Borneo	04 30 N - 114 00 E	18
Macassar, Celebes	05 08 S - 119 24 E	17
Madiun, Java	07 40 S - 111 30 E	17
Maizuru, Japan	35 24 N - 135 20 E	4
Mako, Pescadores	23 35 N - 119 32 E	15
Manila, Philippine Is.	14 35 N - 120 58 E	18
Mankayan, Philippine Is.	16 50 N - 120 46 E	18
Masinloc, Philippine Is.	15 33 N - 119 57 E	18
Miike, Japan	33 03 N - 130 28 E	9
Minamata, Japan	32 11 N - 130 25 E	9
Moji, Japan	33 55 N - 130 58 E	8
Mozan, Korea	42 14 N - 129 16 E	9
Mukden, Manchuria	41 47 N - 123 30 E	11
Muroran, Japan	42 20 N - 140 58 E	1
Nagasaki, Japan	32 43 N - 129 52 E	9
Nagoya, Japan	35 08 N - 136 55 E	3
Nanking, China	32 07 N - 118 47 E	12
Naruo, Japan	34 42 N - 135 22 E	5
Niigata, Japan	37 55 N - 139 03 E	2
Niihama, Japan	33 56 N - 133 17 E	7
Nikko (Kiyotaki), Japan	36 44 N - 139 36 E	2

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Place	Approximate Coordinates	Reference Page In Schedule II
Nobeoka, Japan	32 34 N - 131 40 E	7
Oita, Japan	33 13 N - 131 37 E	7
Okayama, Formosa	22 48 N - 120 18 E	15
Okayama, Japan	34 37 N - 133 54 E	5
Omachi, Japan	36 29 N - 137 51 E	2
Ominato, Japan	41 17 N - 141 10 E	1
Omiya, Japan	35 54 N - 139 37 E	3
Omura, Japan	32 56 N - 129 56 E	9
Omuta, Japan	33 02 N - 130 26 E	8
Onoda, Japan	33 58 N - 131 11 E	6
Osaka, Japan	34 39 N - 135 29 E	5
Ota, Japan	36 17 N - 139 21 E	2
Otaru, Japan	43 10 N - 141 01 E	1
Padang, Sumatra	00 57 S - 100 22 E	17
Palembang, Sumatra	03 00 S - 104 46 E	16
Pambujan Sur, Philippines	11 15 N - 125 32 E	18
Pankalan Brandon, Sumatra	04 02 N - 98 17 E	16
Pankalan Susu, Sumatra	04 07 N - 98 12 E	16
Penang, Malaya	05 22 N - 100 19 E	16
Penhsihu, Manchuria	41 18 N - 123 45 E	11
Phnom Penh, Fr. Indo-China	11 38 N - 104 58 E	14
Pomalaa, Celebes	04 03 S - 121 24 E	17
Poeloe Samboe Is., Sumatra	01 09 N - 103 54 E	16
Port Arthur, Manchuria	38 48 N - 121 16 E	11
Pochan, China	36 35 N - 117 52 E	12
Quang Yen, Fr. Indo-China	21 57 N - 106 48 E	13
Rashin, Korea	42 12 N - 130 18 E	9
Reisui, Korea	34 44 N - 127 44 E	10
Rumoi, Japan	43 57 N - 141 38 E	1
Sabang, Sumatra	05 53 N - 95 19 E	16
Saeki, Japan	32 56 N - 131 53 E	7
Saganoseki, Japan	33 13 N - 131 54 E	7
Saigon, Fr. Indo-China	10 46 N - 106 42 E	13

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Place	Approximate Coordinates	Reference Page In Schedule II
Saitozaki, Japan	33 39 N - 130 21 E	8
Sakata, Japan	38 56 N - 139 49 E	2
Sama Bay, Hainan Is.	18 15 N - 109 30 E	13
San Fernando, Philippines	16 37 N - 120 17 E	18
Sapporo, Japan	43 03 N - 141 19 E	1
Sasebo, Japan	33 10 N - 129 40 E	9
Satahib, Thailand	12 40 N - 100 53 E	15
Seishin, Korea	41 46 N - 129 51 E	9
Semarang, Java	06 58 S - 110 25 E	17
Shako, Korea	40 12 N - 128 39 E	9
Shanghai, China	31 15 N - 121 29 E	12
Shanhaikwan, China	40 00 N - 119 47 E	13
Shih-hwei-yao, China	30 12 N - 115 03 E	12
Shimizu, Japan	34 57 N - 138 29 E	3
Shimonoseki, Japan	33 58 N - 130 55 E	7
Singapore Harbor, Malaya	01 16 N - 103 49 E	16
Singapore Naval Base, Malaya	01 27 N - 103 46 E	16
Ssupingkai, Manchuria	43 12 N - 124 22 E	11
Suiho, Manchuria	40 25 N - 125 00 E	11
Sukegawa, Japan	36 35 N - 140 39 E	2
Suo, Formosa	24 36 N - 121 51 E	14
Surabaya (Soerabaja), Java	07 12 S - 112 43 E	17
Swatow, China	23 21 N - 116 40 E	12
Swettenham, Malaya	03 00 N - 101 23 E	16
Tachikawa, Japan	35 40 N - 139 25 E	3
Taihoku, Formosa	25 02 N - 121 31 E	14
Takamatsu, Japan	34 21 N - 134 03 E	7
Takao, Formosa	22 38 N - 120 16 E	14
Takarazuka, Japan	34 47 N - 135 22 E	5
Taku, China	38 58 N - 117 39 E	13
Tama, Japan	34 28 N - 133 56 E	6
Tandjoeng Oeban, Sumatra	01 04 N - 104 13 E	16

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Place	Approximate Coordinates	Reference Page In Schedule II
Tanjoeng Pinan, Sumatra	00 55 N - 104 27 E	16
Tanjong Priok, Java	06 06 S - 106 53 E	17
Tangku, China	39 01 N - 117 39 E	13
Tarakan, Borneo	03 18 N - 117 36 E	18
Tientsin, China	39 09 N - 117 09 E	12
Tjilatjap, Java	07 44 S - 109 00 E	17
Toba, Japan	34 27 N - 136 50 E	5
Tobata, Japan	33 53 N - 130 50 E	8
Tokuyama, Japan	34 03 N - 131 50 E	6
Tokyo, Japan	35 40 N - 139 45 E	2
Toshien, Formosa	22 40 N - 120 17 E	15
Tosu, Japan	33 23 N - 130 31 E	9
Toyama, Japan	36 40 N - 137 11 E	2
Toyohashi, Japan	34 39 N - 137 23 E	4
Toyokawa, Japan	34 49 N - 137 24 E	4
Tsaochwang, China	34 51 N - 117 36 E	12
Tsingtao, China	36 03 N - 120 20 E	12
Tsitsihar, Manchuria	47 28 N - 124 06 E	11
Tsuruga, Japan	35 37 N - 136 04 E	4
Tumpat, Malaya	06 13 N - 102 11 E	15
Tunghua, Manchuria	41 44 N - 126 01 E	11
Ube, Japan	33 56 N - 131 16 E	6
Uno, Japan	34 28 N - 133 55 E	6
Uraga, Japan	35 13 N - 139 44 E	3
Vinh, Fr. Indo-China	18 40 N - 105 41 E	13
Wakamatsu, Japan	33 55 N - 130 48 E	8
Whampoa, China	23 06 N - 113 17 E	12
Woosung, China	31 22 N - 121 30 E	12
Wuhu, China	31 21 N - 118 25 E	12
Yawata-Kurosaki, Japan	33 50 N - 130 48 E	7
Yokkaichi, Japan	35 05 N - 136 12 E	4
Yokohama, Japan	35 25 N - 139 33 E	3

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Place	Approximate Coordinates	Reference Page In Schedule II
Yokosuka, Japan	35 15 N - 139 40 E	3
Yulinkan Bay, Hainan Is.	18 13 N - 109 32 E	13

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SCHEDULE II

KEY PLACE NAMES - FAR EAST

JAPAN PROPER

Place	Objective Folder	Important Objectives	Comment
HOKKAIDO IS.			The northernmost of Japan's principal home islands.
Rumoi	90.2	Hokkaido Synthetic Oil Co.	Sizeable synthetic oil/coke plant.
Kushiro	90.2	Port facilities; ship concentrations	Exports approx 2,500,000 tons coal annually.
Ishikari River Basin	90.2	Coal Mines; synthetic oil	Heart of Hokaido coal region; small synthetic oil plants near mines.
Sapporo	90.3	Railway Shops	Largest city in Hokkaido, site of only major RR shops on island.
Muroran	90.3	Port facilities; ship concentrations Nihon Steel Company Wanishi Iron Works	Coaling piers handle export of approx 5,000,000 tons annually. Two steel plants, produce substantial amount of iron and steel, as well as ordnance. Significant coke and synthetic oil plants.
Otaru	90.3	Coaling piers; ship concentrations	Export approx 2,500,000 tons coal annually.
Hakodate	90.4	Hakodate Dockyard Imperial Gov't RR Wharves	Hakodate is the Hokkaido Terminus of the train ferry from Aomori. Dockyard has important repair facilities, minor bldg capacity.
HONSHU IS.			The main island of Japan.
Aomori	90.5	Train Ferry Docks Nonai Oil Storage	Aomori is the Honshu terminus of train ferry from Hakodate. Nearby Nonai Oil Storage is important bunkering terminal
Ominato	90.5	Naval Base and Naval Air Base	Largest Naval Base in Northern Japan. 840,000 bbl or more oil storage.
Hachinohe	90.5	Nitto Chemicals Co.	Newly developed industrial area. Producer of Alumina and Aluminum.
Akita (Tsuchizaki)	90.6	Nippon Oil Company	Largest Oil production in Japan Proper. One large and several small refineries with significant aggregate capacity. Principal RR shops in Northern Houshu.

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Place	Objective Folder	Important Objectives	Comment
HONSHU IS. (Cont'd.)			
Kosaka	90.6	Kosaka Copper Smelter and Refinery	Important producer of refined copper. Other smaller refineries and smelters nearby.
Sakata	90.6	Tekkosha Steel and Machinery Plant	Producer of steel alloys and machinery.
Kurosawajiri	90.7	Kokususan Light Metals Industry	Producer of alumina and possibly of aluminum.
Kamaishi	90.8	Imperial Iron and Steel Works	Large iron and steel capacity. Largest iron mines in Japan Proper nearby.
Niigata	90.9	Niigata Iron Works Nippon Oil Company Japan Light Metals	In recent years, Niigata has experienced a significant increase in industrial capacity and now ranks as an important center of machine tool and machinery production. Also significant capacity in oil refining.
Kanose	90.9	Showa Fertilizer Co.	One of leading carbide/ cyanamide plants.
Toyama	90.11	Nichiman Aluminum Co. Nippon Soda Company (Aluminum)	Important aluminum and alumina capacity in suburb of Higashi-Iwase, a few miles N of Toyama. Two smaller aluminum plants rptd S of city.
Omachi	90.12	Showa Aluminum Co.	Major aluminum plant.
Ota	90.13	Nakajima Aircraft Co. (two plants)	Major aircraft assembly and parts plant; army types.
Koizumi	90.13	Nakajima Aircraft Co.	Major aircraft assembly plant; navy types.
Nikko (Kiyotaki)	90.13	Furukawa Copper Refinery	Major copper refinery for nearby Ashio Mines. Also duralumin and copper rolling mills.
Kasumigaura	90.14	Kasumigaura Naval Air Station	Large airbase, important for defense, training and some minor aircraft production.
Sukegawa	90.14	Hitachi Copper Refinery and Smelter Hitachi Engineering Works	Important copper refining and processing capacity, near city. Located in the city is the modern Hitachi machine tool plant.
Tokyo	90.17	Koishikawa Arsenal Area Nippon Elec Co. Tokyo-Shibaura Elec Co. Hitachi Engineering Works Nakajima Aircraft Co. Ishikawajima Dockyard Kokusan Machinery Co	Although not the major center of heavy industry, Tokyo ranks as Japan's leading mfg center. Site of literally thousands of factories, particularly important in aircraft (engines and instruments), electrical and

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Place	Objective Folder	Important Objectives	Comment
HONSHU IS.			
Tokyo (cont'd)	90.17	Showa Aircraft Plant Tokyo Aeronautical Instrument Works	communications equipment, machine tools, and light ordnance. Tokyo is Japan's largest city (population 6,700,000) and the political and economic nerve center of Jap Empire. Tokyo is also the hub of main trunk RR lines on Honshu.
Omiya	90.17	Imperial Govt RR Shops	Largest RR construction and repair shops in area
Tachikawa	90.17	Tachikawa Army Airbase	Large airbase, important repair and aircraft construction facilities.
Kawasaki	90.17	Showa Fertilizer Co. Nippon Electric Co. Tokyo-Shibaura Elec Co. Plants 1 and 2 Steam Power Plants Japan Steel Tube Co. Mitsubishi Oil Rfy Yokohama Rubber Co. Shibaura Engineering Works Hitachi Machine Tool Co.	An industrial suburb of Tokyo, Kawasaki contains one of Japan's most compact concentration of key industrial objectives, principally electrical equipment, machines and machine tools, oil refining, iron and steel, rubber tires. Kawasaki is also the site of several large steam power plants, which generate a substantial percentage of power requirements of Tokyo area.
Yokohama	90.17	Ishikawajima Aircraft Engine Plant Nissan Auto Co. Asahi Glass Co. Harbor Facilities Oriental Babcock Co. (boilers) Ogura Oil Company Yokohama Dockyard Tsurumi Steel and Shipbldg Company	With a population of 960,000 Yokohama is one of Japan's principal ports and an important industrial center. The major industries are shipbuilding, motor vehicles, electrical equipment and oil refining.
Yokosuka	90.17	Yokosuka Naval Base	Naval administrative center; shipbldg and repair; ordnance.
Urara	90.17	Uraga Dock Co.	Shipbuilding and repair.
Shimizu	90.18	Japan Light Metals Co.	Largest alumina capacity in Japan.
Kambara	90.18	Japan Light Metals Co.	Largest aluminum capacity in Japan.
Nagoya	90.20	Mitsubishi Aircraft Works Aichi Aircraft Works Okamoto Aircraft Works Nagoya Arsenals Nihon Vehicle Co. Daido Electric Steel Co. Okuma Iron Works Mitsubishi Electrical Engineering Co.	In recent years, Nagoya has experienced a rapid growth of industrial capacity of major war significance and now ranks as a major war production center. Its principal industries are aircraft, machine tools, steel alloys, ordnance and textiles. A large city

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Place	Objective Folder	Important Objectives	Comment
HONSHU IS.			
Nagoya (cont'd)	90.20	Toyoda Machinery Mfg Co. Port facilities Steam Power Plants	(population 1,300,000), Nagoya is the site of hundreds of small factories. This is also one of Japan's vital RR centers.
Kagamigahara	90.20	Kagamigahara Airbase Kawasaki Aircraft Plant Mitsubishi Aircraft Plant	Major aircraft assembly plants and training field.
Koromo	90.20	Toyoda Automobile Works Aichi and Nakajima Aircraft	New dispersal center of war industry. Site of Japan's newest and largest automotive works (possibly converted to aircraft) and new aircraft plants.
Yokkaichi	90.20	Toho Heavy Industry Ishihara Smelter and Refinery Suzuka Naval Airbase	Recently established plants producing iron and steel, copper and possibly nickel, aircraft delivery and modification center.
Handa	90.20	Nakajima Aircraft Works	Small branch plant.
Kariya	90.20	Toyoda Automobile Works	Automotive parts, engines; light tanks.
Kuwana	90.20	Toyo Bearing Plants Sumitomo Duralumin Mill	Major bearing and dural sheet production.
Hamamatsu	90.21	Japan Musical Instrument Co. (propellers) Government RR Shops	Hamamatsu's chief war industry is the aircraft propeller works. Also significant are the large RR shops.
Toyohashi	90.21	Army Base and Arsenal	Tank proving ground; small arsenal.
Toyokawa	90.21	Toyokawa Naval Arsenal	Aircraft guns and other ordnance.
Maizuru	90.22	Maizuru Naval Station	Shipbldg and repair facilities; arsenal and oil storages.
Tsuruga	90.22	Port facilities; ship concentrations	Best developed port on Japan Sea, used both as commodity port and for military embarkation.
Kyoto	90.23	RR Station, Junction and Yards Matsushita Electric Plants	Although a large city (population over 1,000,000), Kyoto is primarily a cultural center and has no major industry aside from secondary production of electrical equipment and instruments. Its RR station is the hub of several important lines.

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Place	Objective Folder	Important Objectives	Comment
HONSHU IS. (Cont'd)			
Toba	90.24	Kobe Steel Company Toba Dockyard	Toba is the site of a small steel plant rptd to produce marine engines and ordnance. The dockyard builds landing craft and repairs large ships.
Osaka	90.25	Rolling Stock Mfg Co. Osaka Arsenal Port facilities Sumitomo Electric Industry Mitsubishi Copper Rfy Amatsuji Ball Bearing Co. Kwoyo Bearing Co. Osaka Iron Works (Shipyd) Fujinagata Shipyard Maruzen Petroleum Rfy Sumitomo Metal and Aluminum Company Osaka Metal Industry Japan Dyestuffs Steam Power Plants Osaka Machinery Company	Second only to Tokyo as an industrial center, Osaka is the site of thousands of factories. The major industries are ordnance, machinery and machine tools, non-ferrous alloys (dural sheets and aircraft propellers), chemicals, shipbldg, steel and textiles. With a population of 3,200,000, Osaka is Japan's second largest city. It is an important RR transportation corridor and one of Japan's largest ports.
Hirakata	90.25	Branch of Osaka Arsenal	Large ordnance arsenal.
Kobe	90.25	Kawasaki Aircraft Fcty Port facilities Kobe Steel Works Kawasaki Dockyard Mitsubishi Dockyard Dunlop Rubber Works Kawasaki Heavy Industry	With a population of 960,000, Kobe is one of Japan's principal ports and the leading shipbldg center. Other key industries located here are iron and steel, and rubber tires. Kobe is also an important RR center, the terminus of the Tokaido and Sanyo main lines -- Honshu's principal railways.
Takarazuka	90.25	Toyo Bearing Mfg Co.	Large anti-friction bearing plant.
Amagasaki	90.25	Steam Power Plants Kubota Iron Works Mizaguchi Gear Works Nippon Oil Refinery Furukawa Electric Co. Sumitomo Metal Industry	Amagasaki is, in effect, an industrial suburb of Osaka. Its principal industries are machinery and machine tools, metal alloy tube and wire, chemicals, oil refining and steam power plants which supply a substantial amount of the Osaka area's power requirements.
Naruo	90.25	Kawanishi Airplane Co.	Produces large flying boats, engines, propellors, etc.
Akashi	90.25	Kawasaki Aircraft Co.	Large aircraft engine works
Fukae	90.25	Kawanishi Aircraft Co.	New branch plant
Okayama	90.27	Okayama Barracks and Ordnance Depot	Military administrative center for area; reported small arms arsenal. (See Uno, below, for port facilities)

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Place	Objective Folder	Important Objectives	Comment
HONSHU IS. (Cont'd)			
Uno	90.27	Uno Harbor	Secondary army embarkation port. Terminus of RR ferry from Takamatsu on Shikoku Is.
Tama	90.27	Mitsui Tama Shipyard Mitsubishi Copper Smelter and Zinc Refinery	Tama is the site of a large, modern shipyard and marine engine works. Copper and zinc works are located on Nao Island, just SE.
Hirohata	90.27	Japan Iron Works Steam Power Plant	Large steel works, especially important as a producer of ship plate.
Himeji	90.27	Himeji Barracks	Himeji is an "army city"; gas arsenal reported.
Habu (Inno Island)	90.29	Innoshima Shipyards	One of Japan's large shipyards.
Hiroshima	90.30	Army Ordnance Depots Army Transport Base Toyo Industry Japan Steel Works	Hiroshima is an "army city". HQ of the Western Army, it is the site of large supply depots and has been a principal port of embarkation. Significant ordnance, machine tool production.
Kure	90.30	Kure Naval Arsenal Hiro Arsenal Kure Naval Shipyard Kure Naval Base Hiro Naval Aircraft Factory Kanokawa and Hitonose Oil Storages	Kure is Japan's largest naval base, site of vital shipbldg and repair facilities, arsenals, depots, etc.
Tokuyama	90.32	Tokuyama Naval Fueling Station Toyo Soda Co. Tokuyama Naval Coaling Yard O Shima Naval Oil Storage	Principal naval fueling station in Japan; operates in conjunction with Kure Naval Base. Tokuyama is also important for its caustic soda and allied chemicals plants.
Kudamatsu	90.32	Hitachi RR Works Nippon Oil Company (Refinery)	Kudamatsu is the site of a large oil refinery and one of Japan's largest locomotive and RR equipment works, now reported also producing tanks.
Ube	90.32	Nitrogen Fertilizer Plant Riken Metal Co. (Magnesium)	Ube contains a concentration of chemical plants and a large magnesium plant and several collieries which produce low-quality industrial coal.
Onoda	90.32	Nippon Fertilizer Plant Onoda Cement Company	Onoda is the site of one of Japan s largest cement works, and a fertilizer plant.

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Place	Objective Folder	Important Objectives	Comment
HONSHU IS. (Cont'd)			
Shimonoseki	90.34	Shimonoseki RR Wharves	Shimonoseki is an "army city", HQ for the Shomonoseki Strait Defense Command. Its RR wharves, train ferry terminus of the Shimonoseki-Fusan (Korea) ferry, are important.
SHIKOKU IS.			Smallest of Japan's four main islands.
Takamatsu	90.27	Takamatsu Terminal	RR yards and ferry terminal, connects with Uno Transport Base.
Kochi	90.28	Tosa Cement Plant Kochi Steel Plant	Largest city on Shikoku Is, site of small steel works and cement plant. Rptd secondary army embarkation port.
Niihama	90.29	Sumitomo Aluminum and Alumina Plants Sumitomo Chemical Co. Sumitomo Copper Concentrating Mill and Refinery	One of major basic chemicals centers. Important alumina aluminum production and copper refining for nearby Besshi Mines.
KYUSHU IS.			Southernmost of Japan's home islands.
Nobeoka	90.33	Asahi Bemberg Gunpowder Plant Asahi Bemberg Cuprammonium Plant Nippon Nitrogen Explosive Plants	Noebeoka ranks as Japan's leading gunpowder center. It is also the site of important chemical plants operated in conjunction with the large Asahi Bemberg Rayon plants.
Saeki	90.33	Saeki Naval Air Station	Primary naval air station for Navy pilot training and defense of inland sea.
Oita	90.33	Oita Naval Air Station Oita RR Yard Nippon Dye Works	Primary naval air station for carrier-based aircraft training and defense of Bungo Channel. The Nippon Dye Works (at Tsurasaki, near Oita) is rptd to be one of Japan's largest phosgene plants. Bearing plant reported nearby.
Saganoseki	90.33	Saganoseki Copper Works	Site of large copper smelter and refinery. Processes concentrate from Kinkaseki copper mine in Formosa.
Yawata-Kurosaki	90.34	Japan Iron Works Port of Yawata Japan Aluminum Co. Kyushu Chemical Works Nippon Synthetic Chemical Industry	Japan's principal iron and steel center, Yawata is the site Japan Iron works, credited with about 24% of Jap capacity. Its small port handles a large volume of iron ore, coking coal, etc. Located in the suburb of Kurosaki are important alumina and chemical plants.

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Place	Objective Folder	Important Objectives	Comment
KYUSHU IS. (Cont'd)			
Kokura	90.34	Kokura Arsenal Kyushu Soda Co. Kokura Steel Works Kokura RR Shops Steam Power Plants	Kokura is Japan's leading producer of heavy ordnance, as well as chemical warfare materials. It is also the site of the largest RR shops on Kyushu Is.
Tobata	90.34	Port of Tobata Japan Iron Works Tobata Foundry Asahi Glass Co.	In effect an industrial suburb of Yawata, Tobata is the site of a large steel rolling mill as well as chemical plants.
Wakamatsu	90.34	Wakamatsu Port Facilities Nissan Liquid Fuel Co. Tokai Steel Mfg Co. Tochigi Shipyard	Wakamatsu is one of Japan's busiest commodity ports, main outlet for the Kyushu coal fields and receiving point for iron ore, coking coal, bauxite, industrial salt, etc. Also important steel rolling and shipbuilding.
Moji	90.34	Moji Port Facilities Kobe Steel Works Nippon Electric Metallurgical Co. Furukawa Electric Co.	Moji is the largest general cargo port in the Shimonoseki Strait with extensive storage facilities. It is reported as an embarkation port. Important production of electric wire and cable.
Hiko Island	90.34	Mitsubishi Shipyards Osaka Iron Works Oriental High Pressure Industry Mitsui Zinc Works Asahi Oil Refinery and Storage Kanmon RR Tunnel	Hiko Island, just S of Shimonoseki, is highly industrialized. The primary objectives are the shipyds (principally repair dockyards) and the entrance and viaduct to the Kanmon RR tunnel which connects Shimonoseki with S Moji, on Kyushu Is.
Chofu	90.34	Kobe Steel Co Rolling Mill	Large dural sheet mill.
Fukuoka	90.35	Watanabe Iron Works Watanabe Aircraft Plant Nippon Rubber Plant Najima Steam Power Plant	Fukuoka (population 320,000), with its immediate environs, has become a significant industrial center, important for rubber products, munitions, motors and aircraft parts. It is also a coal mining center.
Saitozaki	90.35	Saitozaki Petroleum Storage	Bunkering terminal near Japan Sea entrance to Shimonoseki Strait.
Kurume	90.35	Bridgestone Tire Plant	One of Japan's largest rubber tire plants.
Omuta	90.35	Miike Dyestuffs Oriental High Pressure Plants Miike Machinery Works Mitsui Zinc Refinery Mitsui Coal Liquefaction Plant	One of Japan's largest ~~coal~~ concentrations of basic chemicals production (fertilizers, industrial chemicals and chemical warfare materials). It is also the site of Japan's largest zinc refinery.

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Place	Objective Folder	Important Objectives	Comment
KYUSHU IS. (Cont'd)			
Miike	90.35	Miike Harbor Facilities Miike Coal Yard Steam Power Plants Toyo Alumina Plant	Miike is the export point for the extensive Miike Coal Field, and its port facilities (mechanical coal loaders) are the primary objectives. Sizeable alumina plant.
Kumamoto	90.35	Kumamoto Military Zone	Kumamoto is an "army city", with extensive barracks and ordnance depots.
Tosu	90.35	RR Yards and Repair Shops	Important marshalling yards.
Nagasaki	90.36	Tategami (Mitsubishi Shipyard) Mitsubishi Dockyard Kawanami Shipyard Akunoura Engine Works Hayashi Commerical Co and Engine Works Mitsubishi Steel and Arms Works Nagasaki Wharves	Nagasaki is a leading shipbuilding and ship repair center and the site of a naval munitions plant. It is also an embarkation port. New ordnance plants to north of city.
Sasebo	90.36	Sasebo Naval Dockyard Sasebo Aircraft Factory Naval Arsenal and Engineering Dept. Sasebo Oil Storages	One of Japan's three largest naval bases, strategically located for operations in SW Pacific. Extensive repair and building facilities
Karatsu	90.36	Karatsu Steel Works	One of Japan's leading machine tool plants.
Omura	90.36	Omura Aircraft Works	Large integrated aircraft/engine works.
Minamata	90.37	Japan Nitrogen Fertilizer Company	One of leading nitrogen plants in Japan Proper
Kagoshima	90.38	Kagoshima Station and Freight Yard Sakura Is. Oil Storage	Unconfirmed reports indicate Kagoshima is new center of several war plants, and a secondary naval station
KOREA (CHOSEN)			
Rashin	84.1	Port facilities Rashin RR Station and Yards	Korea's most extensive, modern port; serves N Korea and Manchuria, Naval/military as well as general purpose.
Seishin	84.1	Port facilities RR Yards and RR Workshops Japan Iron Works Mitsubishi Iron Co.	Export point for iron ore/pig iron/foodstuffs. Largest pig iron production in Korea.
Mozan	84.1	Mozan Iron Mine	Largest in Far East
Shako	84.1	Shako Ore Loader	Important iron ore loading point.

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Place	Objective Folder	Important Objectives	Comment
KOREA (Cont'd)			
Agochi	84.1	Agochi Coal Liquefaction Plant	Rated second largest Japanese synthetic oil plant.
Konan	84.2	Chosen Nitrogen Fertilizer	Konan is the site of one of the largest chemical developments in the Far East, producing basic chemicals, alumina aluminum, magnesium and large quantities of nitrates. Large nearby hydroelectric development.
Heijo	84.3	Heijo Army Arsenal Heijo Barracks Mitsubishi Aircraft Factory RR Yards and Shops	Heijo is an "army city", site of second largest mainland arsenal and military depots. Secondary aircraft fcty. Important RR yards and repair shops .
Chinnampo	84.3	Port facilities Japan Mining Co Smelter (Copper and lead) Riken Metals Co (aluminum and magnesium)	Korea's principal west coast port, handles extensive rice tonnages. Important nonferrous metals center.
Kenjiho	84.3	Japan Iron Works	Korea's second largest pig iron and principal steel works.
Gonzan	84.4	Chosen Oil Co Refinery Port facilities	Genzan is a minor naval station and the site of a large refinery.
Keijo	84.6	Ryuzan RR Shops and Yards	Capital of Korea and site of largest RR shops; reported nearby industrial development.
Jinsen	84.6	Port facilities	One of Korea's principal deepwater ports, reported site of iron, aluminum and ordnance plants.
Fusan	84.7	Port facilities RR Workshops	Terminus of Shimonoseki-Fusan ferry and Mukden-Fusan rail line.
Chinkai	84.7	Chinkai Naval Base	Secondary naval station, fueling facilities.
Gunzan	84.8	Port facilities	Rice export port.
Reisui	84.8	Port facilities	Newly developed supplementary port to Fusan.

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MANCHURIA (MANCHUKUO)

Place	Objective Folder	Important Objectives	Comment
Harbin	93.1	RR Shops and Yards	Largest shops in northern Manchuria; northern Manchuria rail hub.
Tsitsihar	93.1	RR Shops	RR shops for NW Manchuria
Kirin	93.2	Kirin Artificial Oil Company	Kirin is the site of Japan's largest synthetic oil plant. The large Sungari River hydro-electric plant is located about 15 mi SE of Kirin
Suiho	93.2	Suiho Hydro-electric plant	Very large power plant, supplies both southeastern Manchuria and northern Korea.
Tunghua	93.2	Tunghua Steel Works	New iron and steel plant
Mukden	93.3	Mukden Arsenal Manchuria Iron Works Manchuria Machine Tool Co. Manchuria Airplane Co. Plants	Mainland arsenal center and most extensive industrial concentration. Principal industries, ordnance machines and machine tools, and aircraft. Hub of Manchuria rail system.
Fushun	93.3	Manchuria Light Metals Company S.M.R. Shale Oil Plant S.M.R. Coal Liquefaction Plant Steam Power Plants	Center of oil and light metals industries, based on locally mined coal and shale. Japan's largest Inner Zone oil source. Major alumina/aluminum and magnesium production. Manchuria's leading coal producing center.
Penhsihu	93.3	Penhsihu Iron Works	Manchuria's second largest iron and steel works.
Anshan	93.3	Showa Steel Works	Anshan is the site of the Japanese Empire's second largest integrated iron and steel works. The Showa Steel Works provides most of the iron and steel required for Manchuria's war economy and exports substantial quantities of pig iron to Japan Proper
Ssupingkai	93.3	Manchuria Coal Liquefaction Co.	Large synthetic oil plant.
Hulutao	93.3	Lead and Zinc Smelter	Major Inner Zone source of lead and zinc.
Dairen	93.5	Manchuria Petroleum Co. Manchuria Dockyd Co. Port facilities South Manchuria RR Workshops Manchuria Chemical Industry Canseishi Coal Pier	Best mainland port north of Shanghai. It is also an industrial center, especially important for railway equipment, oil refining, chemicals, machinery and shipbuilding and repair.
Port Arthur	93.5	Naval Dockyard	Secondary naval station.

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CHINA

Place	Objective Folder	Important Objectives	Comment
Woosung	83.1	Port facilities; ship concentrations	Important military trans-shipment point.
Shanghai	83.1	Shipbuilding and repair yards Municipal Power Plant	Important repair facilities, some building.
Nanking	83.1	RR Ferry and Shops	Capital of Occupied China.
Wuhu	83.1	Ship concentrations	Shipping point for iron ore.
Shih-hwei-yao	83.1	Ship concentration	Shipping point for iron ore.
Hankow	83.1	Port facilities; ware-houses Shipping concentrations	Military shipping point.
Wenchow	83.2	Ship concentrations	Convoy control point.
Foochow	83.3	Ship concentrations	Convoy control point.
Amoy	83.3	Ship concentrations	Convoy control point.
Swatow	83.3	Ship concentrations	Convoy control point.
Canton	83.4	Military depots and airbases	Japanese military base.
Whampoa	83.4	Ship concentrations; port facilities	Military shipping point.
Hong Kong (Kowloon)	83.4	Naval Base Facilities Military depots and oil storages Ship concentrations	Largest ship repair facilities on China coast; principal convoy control point.
Tsingtao	83.11	Port facilities; ship concentrations Steam Power Plant	Important outlet for coal, iron ore and salt.
Laoyao	83.11	Port facilities; ship concentrations Steam Power Plant	Outlet for coal.
Poshan	83.11	Coal mines	Large producers, bituminous coal.
Tsaochwang	83.11	Coal mines	Large producers, bituminous coal.
Chinwangtao	83.12	Port facilities; ship concentrations RR Yards and Shops	Export point for Kailan Coal Mines (about 4½ million tons annually), RR Yards and shops are vital for coal movement to port.
Tientsin	83.12	Wharves; military shipping RR Shops and Yards North China Motor Car Company	Military shipping point; extensive storages for military supplies. Large automotive plant also located here.

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Place	Objective Folder	Important Objectives	Comment
CHINA (Cont'd)			
Tangku	83.12	Port facilities; ship concentrations Alkali Plant	Important export point for large tonnages of coal, salt and iron ore.
Taku	83.12	Port facilities; naval dockyard	Ship repair facilities.
Linsi	83.12	Linsi Power House; coal mines.	Center of coking coal production from Kailan Mines, exported to Japan.
Shanhaikwan	83.12	RR Shops	Largest shops in area, important for maintenance of mining railways.
		HAINAN IS.	
Hoihow	83.6	Military stores and headquarters	No port facilities except at new port four miles west. Kiungshan Airbase one mile S.
Yulinkan Bay	83.6	Port facilities; ship concentrations Naval Supply Depot; fuel stores	Hainan's best port; secondary naval station and convoy control point. Shipping port for iron ore.
Sama Bay	83.6	Military depots; minor port facilities Sama Airbase	Military storage area.
		FR. INDO-CHINA	
Haiphong	85.1	Cement Plant Phosphate Plant Port facilities	Haiphong, best-equipped port in northern Indo-China, is the site of a large cement plant and a phosphate plant.
Hanoi	85.1	Steam Power Plant RR Station and Yards, Shops Alcohol Distillery Doumer Bridge	A hub for northern Indo China railways, Hanoi is also the site of the area's largest power plant.
Campha	85.1	Coal port	Coal shipping point.
Hongay	85.1	Coal Briquette Plant Power Plant Coal Port	Coal shipping point.
Vinh	85.1	Vinh RR Repair Shops Power Plant Wooden Shipbuilding	Largest RR shops in N Indo-China
Quang Yen	85.1	Zinc Smelter	Produces slab zinc for export to Japan.
Saigon	85.2	F.A.C.I. Shipyd and Fdry	Capital and largest port, Saigon is Indo-China's leading

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Place	Objective Folder	Important Objectives	Comment
FR. INDO-CHINA (Cont'd)			
Saigon (cont'd)	85.2	Navy Yard and Arsenal RR Repair Shops Alcohol Distilleries Machine Shops Power Plant Oil Storages Wooden Shipbuilding	mfg city, especially important for ship repair, machinery and light ordnance, rice and alcohol plants and RR Repair shops.
Phnom Penh	85.2	Barge Bldg Works Alcohol Distillery RR Shops and Yards	Small boat shipyard.
Cam Ranh Bay	85.2	Possible fleet anchorage	Probable convoy control point.
Cap St.Jacques	85.2	Shipping	Convoy control point.
		FORMOSA (TAIWAN)	
Keelung (Kiirun)	91.3	Keelung Wharves Electro-Chemical Plants Gyucho Dockyard Matto Ko Steam Power Plant Sharyo To Shipyard	Formosa's largest port, Keelung is the site of extensive storage facilities and ship repair yards. Rptd to be convoy control point.
Taihoku	91.3	Taihoku RR Terminal Matsuyama RR Shops and Fdry Jonai District of Taikoku	Administrative center of Formosa and adjacent territories. Site of many public buildings and important RR installations.
Kinkaseki	91.3	Kinkaseki Copper Works	Large copper mine and concentrating mill; exports to Japan Proper.
Lake Jitsugetsutan	91.4	Jitsugetsutan Hydro-Electric Power Plants	Large plants, supply over half of Formosa's power.
Kinsui	91.4	Casing-head Gasoline Plant Carbon-Black Plant	Natural gas producing center, site of important carbon-black plant.
Karenko	91.5	Japan Aluminum Company Nickel Smelter Karenko Wharves	Only developed port on east coast and site of new industrial plants.
Suo	91.5	Suo Basin	Largest anchorage on east coast; reported submarine base.
Takao	91.6	Nippon Aluminum Company Military Storehouses Port facilities; ship concentrations RR Repair Shops Kigo Naval Dockyard	Site of extensive military depots and large aluminum/alumina plant, chemical and munitions plants. Important convoy control port

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Place	Objective Folder	Important Objectives	Comment
FORMOSA (Cont'd)			
Toshien	91.6	New Naval Base	Large naval base under construction.
Heito	91.6	Heito Airport Branch Air Depot	Large airbase, located in center of extensive military zone. Many satellite fields and army camps nearby.
Okayama	91.6	Okayama Aircraft Plant	Large aircraft repair and assembly plant.
PESCADORES ILS.			
Mako	91.7	Mako Naval Station	Minor naval base, with large oil storage facilities, airport, etc. Convoy control point.
THAILAND (SIAM)			
Satahib	98.2	Satahib Naval Base; oil stores	Thailand's only developed naval station.
Ban Pachi	98.2	RR Junction	RR jc N-S, E-W RR
Korat	98.2	RR Station, Yards and Junction	Important RR hub.
Bangkok	98.3	Royal Aeronautical Force Workshops Royal Ordnance Factory Army Chemical Works Thai Electric Co Power Plant Port facilities; ship repair yards RR Workshops, bridge Thai Cement Company Oil Refinery	Capital of Thailand and only large industrial center, especially important for arms and munitions, electric power, transportation maintenance and SE Asia's largest cement plant.
BURMA			
No Key Place Names included because of the tactical nature of the targets.			
MALAYA (MALAY STATES & SINGAPORE)			
Tumpat	92.1	Shipping	Iron ore shipping point.
Kota Bahru	92.1	Shipping	Iron ore shipping point.
Kuala Dungun	92.1	Shipping	Iron ore shipping point.
Endau	92.1	Shipping	Iron ore shipping point.
Kemaman	92.1	Shipping	Iron ore shipping point.

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Place	Objective Folder	Important Objective	Comment
MALAYA (Cont'd)			
Penang	92.1	Port facilities; ship repair; shipping Tin Smelter	Malaya's second largest port.
Swettenham	92.1	Port facilities; shipping	Malaya's third largest port.
Kuala Lumpur	92.1	RR Yards, repair shops Machine Shops	RR center, and site of machine shops serving mines in area.
Batu Pahat	92.2	Shipping	Shipping point for iron ore and bauxite.
Singapore Naval Base	92.2	Principal naval base; fuel depots; shipbldg and repair, military depots, machine shops, etc.	Vital naval base; convoy control point.
Singapore Harbor	92.2	Port facilities; large ship repair facilities	One of largest and best equipped ports in Far East.
		SUMATRA (N.E.I.)	
Sabang	94.1	Oil loading port facilities; power plant	Oil bunkering port; strategically located for operations in Indian Ocean.
Poeloe Samboe Is.	94.1	Tank Farm	Important oil storage.
Pankalan Brandon	94.1	Oil center; large refinery	Large oil center, refinery reported partially restored; very large capacity.
Tandjoeng Ceban	94.1	Oil Storage	Important oil storage.
Pankalan Susu	94.1	Oil tanker terminal	Tanker loading point for Pankalan Brandon oil products
Belawan	94.1	Oil Storage	Recently constructed pipeline from Pankalan Brandon.
Tandjoeng Pinan	94.1	Port facilities	Bauxite ore shipping point, handling large tonnages of Bintan Is. bauxite.
Bintan Is.	94.1	Bauxite Plant	Bauxite ore treating plant; major source of bauxite for Japan's aluminum industry.
Palembang	94.2	Pladjoe Refinery Port facilities (oil loading wharves); Machine shops; RR Yds Soengei Gerong Refinery	The Pladjoe and Soengei Gerong refineries (near Palembang) produce half of Japan's current aviation gasoline and about 25% of fuel oil. Also important are the tanker loading wharves and the tankers themselves.

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Place	Objective Folder	Important Objectives	Comment
SUMATRA (Cont'd)			
Emma Haven	94.2	Port facilities	Coal shipping point and small oil storage.
Padang	94.2	Indarung Cement Plant	Probably only N.E.I. cement plant.
JAVA (N.E.I.)			
Batavia	94.3	Manggarai RR Workshops	Principal city in western Java, important RR center.
Tanjong Priok	94.3	Port facilities; General Motors Assembling Plant	Largest port in western Java.
Bandung	94.3	Quinine Factory RR Station and Repair Shops Arsenal	Bandung, site of the N.E.I.'s largest quinine plant; also an important RR center; small arms arsenal.
Tjilatjap	94.3	Port facilities; RR Yards	Only large harbor on Java's south coast.
Semarang	94.3	Machine Shop and Structural Steel Works RR Jc; minor port facilities Wooden shipbuilding	Small port, site of large machinery and structural steel works and junction of Java's main trunk lines (different gauges).
Madiun	94.3	Locomotive Repair Shops	Large shops.
Surabaya (Soerabaja)	94.3	Port facilities Ship Repair Docks; Machine Shops East Java Literage Company Wonokromo Oil Refinery Tjepoc Oil Refinery	Largest port in Java both naval and commericial harbors, site of important ship repair facilities, large machine shops and an oil refinery. Wooden shipbuilding.
Buitenzorg	94.3	Goodyear Tire Plant	Probably producing truck and other tires for Japanese needs in N.E.I.
CELEBES (N.E.I)			
Kolaka	94.5	Nickel ore mines	Principal source of Jap nickel ore.
Pomalaa	94.5	Nickel Mines and Concentration Plant	Shipping point for Kolaka nickel ore.
Macassar	94.5	Port facilities Power Station	Largest harbor in Celebes.

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TIMOR

Place	Objective Folder	Important Objectives	Comment
Koepang	94.5	Port facilities; airbase	Main Japanese base on Timor.
Dilli	94.5	Port facilities	Timor's best port.
CERAM IS. (N.E.I.)			
Boela	94.6	Oil Center	Small crude oil source and large storage capacity.
BORNEO (N.E.I.)			
Lutong	81.1	Shell Oil Company Refinery	Oil producing center; site of large refinery. Large oil storage.
Balikpapan	94.1	Oil center; partially restored refinery Port facilities	Important producer of lube oils and other petroleum products; extensive oil fields nearby; large tank farms.
Tarakan	94.1	Oil center port facilities	Important source of curde suitable as fuel oil without refining; tanker terminal.
PHILIPPINE IS.			
Manila	96.1	Coconut Oil Refineries Steam Power Plant Port facilities; ship concentrations Rope Factories RR Yards and Shops	Important source of Japanese coconut oil and hemp. All ship repairs except major overhaul of large vessels.
Calambayanga	96.1	Ore loading facilities; shipping	Important iron ore shipping point.
San Fernando	96.1	Copper loading facilities; shipping	Copper concentrate loading point for Lepanto Copper Mines.
Masinloc	96.1	Port facilities; shipping	Chrome ore shipping point.
Cavite	96.1	Naval base facilities	Ship repair facilities, depots, etc. reported restored.
Mankayan	96.1	Copper Works	Large concentrating mill of Lepanto Copper Mines.
Iloilo	96.2	RR Yards Oil Storages; shipping	Oil bunkering terminal. Jap base in central islands.
Cebu	96.2	Port facilities; shipping Cement Mill	Good harbor and large cement mill. Jap base.
Pambujan Sur	96.2	Ore loading facilities; shipping	Iron ore shipping point.
Davao	96.2	Port facilities; ship concentrations	One of principal Jap bases in Philippines; port at Santa Ana one mile SW.

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Place	Objective Folder	Important Objectives	Comment
PHILIPPINE IS. (Cont'd)			
Legaspi	96.2	Port facilities; shipping Oil Storages	Shipping point for copra and sugar. Southern terminus Luzon railroad.

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JAPAN PROPER 90 KARAFUTO AREA 90.1

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
951	Port of Esutoru	Esutoru	49 08-142 02	M	S							X							
952	Port of Maoka	Maoka	47 03-142 03	M	S							X							
953	Port of Otomari	Otomari	46 38-142 46	S	P							X							
954	Port of Honto	Honto	46 41-141 51	M	S							X							
959	Hydro Power Plant	Komuna	47 03-142 44	M	M						X								
961	Hydro Power Plant	Toyohara	46 56-142 39	M	M						X								
962	Synthetic Oil Plant,Naihoro	Honto	46 40-141 50	S	P											X			
965	Shikuku Pulp Factory	Shikuku	49 14-143 07	M	M														Pulp & Paper
966	Otomari Pulp Factory	Otomari	46 38-142 47	M	M														Pulp & Paper
967	Toyohara Pulp Factory	Toyohara	46 58-142 44	M	M														Pulp & Paper
968	Maoka Pulp Factory	Maoka	47 02-142 02	M	M														Pulp & Paper
969	Noda Pulp Factory	Noda	47 27-141 59	M	M														Pulp & Paper
970	Ochiai Pulp Factory	Ochiai	47 21-142 47	M	M														Pulp & Paper
971	Shitori Pulp Factory	Shiritori	48 38-142 47	M	M														Pulp & Paper
972	Tomarioru Pulp Factory	Tomarioru	47 46-142 04	M	M														Pulp & Paper
973	Esutoru Pulp Factory	Esutoru	49 08-142 05	M	M														Pulp & Paper

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JAPAN PROPER 90 HOKKAIDO NORTH 90.2 MURORAN 90.3 HAKODATE 90.4

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
☆ 378	Nihon Steel Works	Muroran	42 19-141 00	P	P								X						
☆ 379	Wanishi Iron Works	Muroran	42 20-141 01	P	P								X						
381	Muroran Harbor Facilities	Muroran	42 20-140 59	S	P				X										
974	Hakodate Dockyard	Hakodate	41 47-140 43	S	P							X							
975	Western Wharf and Warehouses	Hakodate	41 47-140 43	S	P							X							
976	Eastern Wharves and Warehouses	Hakodate	41 47-140 43	S	P							X							
977	Imperial Goverment Railway Wharves	Hakodate	41 47-140 43	S	P							X							
979	Goryokaku Railroad Shops	Hakodate	41 47-140 43	S	P							X							
980	Fuel Oil Storage	Hakodate	41 48-140 44	S	P												X		
983	Hokkai Cement Plant (Asano Portland Cement Co)	Hakodate	41 47-140 44	M	S											X			
985	Ebetsu Power Plant	Taniyosai	41 49-140 38	S	P														Cement
988	Mitsubishi Coal Liquefaction Plant	Ebetsu	43 07-141 34	S	P						X								
990	Sapporo Shops of Imperial Goverment Railroad	Muroran	42 20-141 01	M	S											X			
992	Otaru Harbor	Sapporo	43 04-141 23	S	P												X		
1027	Nippon Oil Refinery	Otaru	43 12-141 00	S	P							X							
1048	Wakkanai Harbor	Karugawa	43 07-141 15	M	M											X			
1049	Kushiro Synthetic Oil Plant	Wakkanai	45 25-141 41	M	S							X							
1050	Takikawa Synthetic Oil Plant	Kushiro	43 00-144 22	S	S											X			
1541	Shimizusawa Power Plant	Takikawa	43 34-141 54	S	S											X			
1542	Sunagawa Power Plant	Shimizusawa	43 00-142 01	S	P						X								
1543A	Uryu Power Plant	Sunagawa	43 29-141 55	S	P						X								
1543B	Uryu Power Plant Dam	Uryu River	44 16-142 20	M	S						X								
		Uryu River	44 18-142 11	M	S						X								

HOKKAIDO NORTH 90.2, MURORAN 90.3, HAKODATE 90.4

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JAPAN PROPER 90 HOKKAIDO NORTH 90.2 MURORAN 90.3 HAKODATE 90.4

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mech/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1551	Tomakomai Pulp & Paper Mill & Power Plant	Tomakomai	42 38-141 36	M	S						X								
1552	Chitose Power Plant No.1	Chitose	42 47-141 26	M	S						X								Pulp
1553	Abuta Power Plant	Abuta	42 33-140 45	M	S						X								
1554	Kushiro Harbor	Kushiro	42 59-144 23	S	P							X							
1555	Nemuro Harbor	Nemuro	42 20-145 35	M	S							X							
1556	Rumoi Harbor	Rumoi	43 57-141 38	M	S							X							
1561	Hokkaido Synthetic Oil Co.	Rumoi	43 57-141 38	S	P											X			
1562	Yubari Coal Mines	Yubari	43 04-141 59	S	P				X							X			
1563	Mitsubishi Bibai Coal Mine	Bibai-Tanzan	43 19-141 59	S	P				X							X			
1564	Iwamizawa Synthetic Oil Plant	Iwamizawa	43 12-141 45	S	S											X			
1565	Abashiri Harbor	Abashiri	44 01-144 17	M	S							X							
1571	Kushiro Mill,Oji Paper Co.	Kushiro	43 00-144 22	M	M														Pulp
1572	Ebetsu Mill,Oji Paper Co.	Ebetsu	43 07-141 33	M	M														Pulp
1573	Ochiishi Wireless Station	Cape Ochiishi	43 09-145 30	M	P														Communication
1574	Obihiro Linen Plant	Obihiro	42 55-143 12	M	M														Linen
1575	Bihoro Linen Plant	Bihoro	43 49-144 07	M	M														Linen
1576	Ikeda Linen Plant	Ikeda	42 55-143 26	M	M														Linen
1577	Nayoro Linen Plant	Nayoro	44 21-142 28	M	M														Linen
1578	Shimo-Yubetsu Linen Plant	Shimo-Yubetsu	44 13-143 38	M	M														Linen
1579	Pombetsu Linen Plant	Pombetsu	43 07-143 38	M	M														Linen
1580	Memuro Linen Plant	Memuro	42 54-143 04	M	M														Linen
1582	Tsukigata Linen Plant	Tsukigata	43 20-141 40	M	M														Linen

HOKKAIDO NORTH 9 ,MURORAN 90.3,HAKODATE 90.4

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JAPAN PROPER 90 HOKKAIDO NORTH 90.2 MURORAN 90.3 HAKODATE 90.4

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1583	Sapporo Linen Plant, No. 1	Sapporo	43 04-141 21	M	M														Linen
1584	Sapporo Linen Plant, No. 2	Sapporo	43 07-141 20	M	M														Linen
1585	Abuta LinenPlant	Abuta	42 33-140 46	M	M														Linen
1586	Shotan Linen Plant	Shotan	42 32-140 47	M	M														Linen
1587	Kuriyama Linen Plant	Kuriyama	43 04-141 47	M	M														Linen
1623	Asahigawa Railroad Yards	Asahigawa	43 46-142 22	M	P													X	

HOKKAIDO NORTH 90., MURORAN 90.3, HAKODATE 90.4

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JAPAN PROPER 90 AOMORI 90.5

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mach/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Wy Trans	OTHER
993	Aomori Harbor and Ferry Piers	Aomori	40 50-140 44	S	P							X						X	
994	Warehouses - Aomori City	Aomori	40 50-140 44	M	S							X							
995	Rising Sun Pet & Std Vacuum Oil	Nonai	40 51-140 49	S	P												X		
996	Ominato Naval Base & Air Station	Ominato	41 17-141 10	S	P										X				
997	Aomori Railway Yards	Aomori	40 49-140 45	S	P													X	
1557	Nitto Chemicals Co.	Hachinohe	40 32-141 31	S	S			X								X			
1876	Nippon Special Steel Tubing (Ominato Plant)	Ominato	41 18-141 13	M	M											X			
1895	Tekkosha Works Co.	Aomori	40 49-140 45	S	S			X									X		
1896	Northeast Japan Promotion Co.	Aomori Ken	40 31-141 29	M	M			X											
1897	Nippon Iron Sand Co.	Hachinoke	40 31-141 29	M	M								X						
1898	Iwaki Cement Co.	Hachinoke	40 31-141 32	M	M														Cement
1900	Iwaki Cement Co.	Sannohe gun	40 30-141 32	M	M														Cement
1902	Towada Hydroelectric Plant	Aomori Ken	40 35-141 05	M	S					X									

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JAPAN PROPER 90 AKITA 90.6

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mech/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
808	Osarizawa Copper Smelter	Osarizawa Mura	40 11-140 45	S	S											X			
809	Kosaka Copper Smelter & Refinery	Kosaka Machi	40 20-140 45	S	S											X			
1064	Arakawa Copper Smelter	Arakawa	39 38-140 25	S	S											X			
1065	Ani Copper Smelter	Ani	39 59-140 26	M	M											X			
1066	Nippon Oil Co. Refinery	Tsuchizaki	39 46-140 04	S	S												X		
1067	Funakawa Oil Refinery	Funakawa	39 52-139 51	S	S												X		
1068	Tsuchizaki RR Shops	Tsuchizaki	39 45-140 05	S	P													X	
1899	Akita Railroad Yards	Akita	39 03-140 07	M	S													X	
1901	Akita Lumber Co. & Engineering Works	Noshiro	40 13-140 02	M	M														Construction
1910	East Asia Light Metals Co.	Sakata	38 56-139 49	S	S											X			
1911	Nippon Chemical Plant	Sakata	38 56-139 49	S	S			X											
1913	Dai Nippon Copper Refinery & Smelter	Tsuhaki	40 22-140 01	S	S											X			
1915	Tekkosha Steel Plant	Sakata	38 56-139 51	S	S								X						
1916	Tekkosha Steel & Machinery Plant	Sakata	38 56-139 49	S	S								X				X		
1917	Obonai Hydroelectric Plant	Obonai	39 41-140 42	M	S					X									
1918	Natsuse Hydroelectric Plant	Natsuse	39 38-140 41	M	M					X									
1919	Shindai Hydroelectric Plant	Shindai	39 36-140 39	M	M					X									

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JAPAN PROPER 90 MORIOKA 90.7

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1072	Kuji Sponge Iron Plant	Kuji	40 11-141 46	M	M								X						
1074	Morioka RR Yards & Repair Shops	Morioka	39 42-141 18	S	S													X	
1759	Kokusan Light Metals Industry	Kurosawajori	39 17-141 07	S	P											X			
1790	Iron Works Co. Ltd	Kurosawajori	39 18-141 07	M	S								X						

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JAPAN PROPER 90 KAMAISHI 90.8

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
☆189	Imperial Iron & Steel Works	Kamaishi	39 16-141 53	P	P				X				X						
190	Kamaishi Harbor	Kamaishi	36 16-141 54	M	P							X							
1792	Tohoku Cement Co.	Atohama	39 04-141 45	M	M														Cement
1794	Rasa Industrial Co.	Miyako	39 38-141 58	M	M											X			

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JAPAN PROPER 90 NIIGATA 90.9 FUKUSHIMA 90.10

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
881	Inawashiro Hydro Plant No. 1	Nippashi River	37 33-140 00	S	S						X								
900	Inawashiro Hydro Plant No. 2	Nippashi River	37 33-139 59	S	S						X								
901	Inawashiro Hydro Plant No. 3	Nippashi River	38 33-139 57	M	M						X								
902	Inawashiro Hydro Plant No. 4	Nippashi River	37 34-139 55	S	S						X								
998	Niigata Iron Works Plant No. 1	Niigata	37 56-139 04	P	P									X					
999	Niigata Iron Works Plant No. 2	Niigata	37 56-139 04	P	P									X					
1000	Nippon Oil Co. Refinery	Niigata	37 55-139 04	S	P												X		
1003	Japan Light Metals Co.	Niigata	37 54-139 02	P	P											X			
1012	Oil Storage No. 1	Niigata	37 57-139 05	M	S												X		
1013	Oil Storage No. 2	Niigata	37 56-139 04	M	S												X		
1023	Niigata RR Yards	Niigata	37 55-139 04	M	S													X	
1077	Fukushima RR Yards	Fukushima	37 45-140 28	M	S													X	
1088	Japan Refining Co.	Koriyama	37 23-140 24	M	M			X											
1101	Electro-Chem Industry Co., Aomi Plant	Aomi	37 00-137 47	M	M			X											
1104	Nagamachi Marshalling Yards	Sendai	38 13-140 53	S	P													X	
1536	Showa Fertilizer	Kanose	37 42-139 28	S	P			X											
1588	Shingo Hydro Plant	Agano River	37 36-139 44	S	S						X								
1589	Toyomi Hydro Plant	Agano River	37 42-139 34	S	S						X								
1590	Kanose Hydro Plant	Agano River	37 42-139 28	S	S						X								
1592	Shinano Electric Power	Shinano River	37 03-138 40	S	P						X								
1593	Senju Electric Power	Shinano River	37 09-138 45	S	P						X								
1606	Akimoto Hydro Plant	Agano River	37 39-140 06	M	M						X								

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JAPAN PROPER 90 NIIGATA 90.9 FUKUSHIMA 90.10

TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Wwy Trans	OTHER
1607	Horai Hydro Plant	Abukuma River	37 41-140 29	S	S						X								
1649	Nippon Oil Refinery - Kashiwazaki	Kashiwazaki	37 23-138 35	M	S											X			
1651	Nippon Stainless Steel, Naoetsu Plant	Naoetsu	37 10-138 15	M	P								X						
1655	Koriyama RR Shops	Koriyama	37 23-140 23	S	P													X	
1656	Tsugami-Atagi Machine Tool Co.	Nagaoka	37 26-138 51	M	S									X					
1658	Northeast Aluminum Plant	Kashiwazaki	37 23-140 23	M	S										X				
1659	Niigata Iron Works, Kashiwazaki Plant	Kashiwazaki	37 22-138 33	M	S									X					
1660	Niigata Iron Works, Nagaoka Plant	Nagaoka	37 27-138 52	M	S									X					
1661	Osaka Machinery Co., Plant No. 1	Nagaoka	37 28-138 53	M	S									X					
1662	Osaka Machinery Co., Plant No. 2	Nagaoka	37 28-138 52	M	S									X					
1663	Tohoku Tokushu KK	Sendai	38 14-140 51	M	S								X						
1664	Tokyo Shibaura Electric Co., Oguni Plant	Oguni	38 03-139 45	S	P								X						
1665	Shinagawa Mfg Plant	Fukushima	36 46-140 27	M	M	X													
1666	Nippon Soda, Odera Refinery	Hirota	37 33-139 59	S	S			X											
1667	Shinetsu Nitrogen Fertilizer, Naoetsu Plant	Naoetsu	37 10-138 14	S	S			X											
1668	Riken Steel, Machinery & Machine Tool Plants	Kashiwazaki	37 22-138 34	M	S								X	X					
1669	Riken Steel, Boiler & Engine Plants	Nagaoka	37 25-138 51	M	S								X	X					
1670	Niigata Harbor	Niigata	37 56-139 04	S	P						X								

NIIGATA 90.9, FUKUSHIMA 90.10

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JAPAN PROPER 90 TOYAMA 90.11

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
861	Nichiman Aluminum Co.	Higashi-Iwase	36 45-137 14	S	P											X			
862	Docks & Harbor Facilities - Higashi Iwase	Higashi-Iwase	36 46-137 14	M	P							X							
865	Nippon Carbide Kogyo - Nitrogen Works	Uotsu	36 49-137 24	M	S			X											
866	Nippon Soda Co.	Takaoka	36 46-137 01	S	P			X											
867	Fushiki Harbor Facilities & Docks	Fushiki	36 47-137 04	M	M							X							
869	Kawasaki Iron Works	Fushiki	36 47-137 05	M	M								X						
870	Nanoa Harbor	Nanoa Harbor	36 47-137 05	S	P							X							
871	Kanazawa RR Station & Repair Shops	Kanazawa	36 35-136 39	S	P													X	
873	Komaki Hydro Plant	Sho River	36 34-137 00	S	S						X								
874	Kanidera Hydro Plant	Jintsu River	36 27-137 15	M	M						X								
875	Soyama Hydro Plant	Sho River	36-28-136 59	S	S						X								
876	Yanagawara Hydro Plant	Kurobe River	36 48-137 35	S	S						X								
877	Kurobe No. 2 Hydro Plant	Kurobe River	36 45-137 39	S	S						X								
936	Nissan Chemical Co. No. 1	Toyama	36 40-137 11	M	S		X												
937	Nissan Chemical Co. No. 2	Fushiki	36 47-137 03	M	M		X												
938	Nissan Chemical Co. No. 3	Nanao	37 02-137 00	M	M		X												
939	Hokkai Soda Co. Niigima	Fushiki	36 47-137 04	M	M		X												
940	Nippon Steel Tubing Co.	Fushiki	36 47-137 05	M	S								X						
941	Fujihoshi Steel Co.	Toyama	36 41-137 14	S	P									X					
942	Japan High Frequency Steel Co.	Fushiki	36 45-137 05	M	M								X						
943	Japan Electric Forging Co.	Fushiki	36 44-137 03	M	M								X						
1608	Kurobe No. 3 Elec Power Plant	Kurobe River	36 42-137 39	S	S					X									

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JAPAN PROPER 90 NAGANO 90.12 TAKASAKI 90.13

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
789	Nakajima Aircraft Co. Ota Parts Plant	Ota	36 18-139 22	S	S	X													
810A	Furukawa Copper Ore Dressing Plant	Tsudo	36 39-139 25	S	S											X			
810B	Furukawa Smelter	Honzan	36 41-139 26	S	S											X			
810C	Furukawa Machine Shops	Mato	36 40-139 26	M	S											X			
811	Furukawa Copper Refinery	Kiyotaki	36 44-139 33	P	P											X			
1051	Takasaki RR Yards	Takasaki	36 19-139 01	M	S													X	
1059	Saku Hydroelectric Plant	Tone River	36 29-139 02	S	S						X								
1098	Nagano Government Railroad Shops	Nagano	36 38-138 11	S	P													X	
1100	Showa Denko Aluminum - Omachi	Omachi	36 29-137 51	P	P											X			
☆1544	Nakajima Aircraft Co. New Ota Plant	Ota	36 18-139 23	P	P	X													
☆1545	Nakajima Aircraft Co. Koizumi Plant	Koizumi	36 15-139 25	P	P	X													
1546	Nakajima Aircraft Co. MaebashiParts Plant	Maebashi	36 22-139 05	S	S	X													
1611	Nakatongawa Hydro Plant No. 1	Nakatsu River	36 58-138 40	S	S					X									
1613	Shimotaki Hydro Plant	Shimotaki	36 50-139 43	S	S					X									
1642	Nippon Soda KK	Nihongi	36 59-138 14	S	S			X											
1643	Utsunomiya Air Trn School & Arsenal	Utsunomiya	36 33-139 52	S	P														Aviation
1644	Kumagaya Air Base	Kumagaya	36 09-139 22	S	P	X													
1645	Kakuwa Mgf Co.	Utsunomiya	36 34-140 54	S	S	X													
1646	Riken Industrial Co, Maebashi	Shm Maebashi	36 23-139 03	S	S									X					
1647	Riken Industrial Co, Takasaki	Takasaki	36 20-139 01	S	S									X					
1650	Nakajima Aircraft Co, Kumagaya Parts Plant	Kumagaya	36 09-139 22	S	S	X													

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JAPAN PROPER 90 MITO 90.14

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
371	Tateyama Naval Air Station	Tateyama	34 59-139 50	S	P	X													
373	Kisarazu Naval Air Station	Kisarazu	35 24-139 55	S	P	X													
812	Hitachi Copper Refinery	Sukegawa	36 36-140 39	P	P											X			
1466	Kasumigaura Naval Air Station	Kasumigaura	36 03-140 13	S	P	X													
1476	Hitachi Engineering Wks Kaigon Plant	Sukegawa	36 35-140 39	P	P									X					
1477	Kisarazu Fleet Fueling Base	Kisarazu	35 23-139 55	S	P										X				
1479	Toride Railroad Bridge	Toride	35 53-140 04	S	P													X	
1491	Kasumigaura Naval Air Station	Kasumigaura	36 03-140 13	S	P	X													
1492	Hitachi Copper Smelter	Sukegawa	36 37-140 38	P	P											X			
1519	Ito Aircraft Plant	Chiba City	35 40-140 02	M	S	X													
1520	Riken Vacuum Tubes Plant	Mohara	35 26-140 18	M	S														Radio Equip.
1521	Showa Chemical & Fertilizer Plant	Showa	35 08-140 16	M	M			X											
1522	Shinohara Machinery Works	Tsudanuma	35 41-140 04	S	P									X					

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JAPAN PROPER 90 TAKAYAMA 90.15

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1480	Hida Mokko Co.	Takayama	36 08-137 16	S	S	X													
1481	Daido Industrial Co.	Takayama	36 18-136 17	S	S									X					
1482	Kaga Rim Mfg. Co.	Takayama	36 24-136 28	M	M									X					
1483	Komatsu Engineering Works	Takayama	36 24-136 28	S	S									X					
1484	Kamioka Mine & Smelter	Takayama	36 22-137 18	S	S											X			

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JAPAN PROPER 90 KOFU 90.16

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	Elec Eqp/Radar	Elec Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Dwy Trans	OTHER
1496	Chichibu Cement Co.	Kofu	36 00-139 05	S	S														Cement
1498	Otaki Hydro Plant No. 1	Kiso	35 55-137 12	S	S						X								
1499	Momoyama Hydro Plant & Substation	Kiso	35 45-137 42	S	S						X								
1502	Yomikaki Hydro Plant	Kiso	35 55-137 36	S	S						X								
1505	Oi Hydro Plant	Kiso	35 29-137 24	S	S						X								
1515	Yatsuzawa Hydro Plant	Sagami River	35 37-139 06	S	S						X								
1591	Yasuoka Hydro Plant	Tenryu River	35 22-137 49	S	S						X								
1615	Kasagi Hydro Plant	Kiso River	35 28-137 17	S	S						X								
1652	Minakata Hydro Plant	Tenryu River	35 37-137 56	S	S						X								

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JAPAN PROPER 90 TOKYO 90.17

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
51	Asano Iron Works	Kawasaki	35 29-139 42	S	P				X				X						
☆ 52	Japan Steel Tube Co.	Kawasaki	35 30-139-43	P	P								X						
56	Fuji Steel Works - Imperial Iron & Steel	Kawasaki	35 32-139 44	S	P								X						
57	Oriental Steel Products Co.	Kawasaki	35 30-129 43	M	S								X						
58	Tokyo Special Steel & Chrome Works	Kawasaki	35 32-139 42	M	S								X						
62	Hodogaya Substation	Yokohama	35 27-139 37	M	M						X								
66	Takashima Freight Yard	Yokohama	35 28-139 38	M	S													X	
67	Stations, Junctions, Overpass	Yokohama	35 28-139 38	M	M													X	
68	Higashi Yokohama Yard	Yokohama	35 27-139 38	M	S													X	
69	Yokohama Dockyard - Mitsubishi	Yokohama	35 27-139 38	P	P										X				
70	Asano Dockyard	Yokohama	35 28-139 39	P	P										X				
71	Uraga Dockyard, No. 3	Yokohama	35 28-139 38	P	P										X				
72	Ford Motor Co.	Yokohama	35 29-139 39	M	S									X					
75	Furukawa Elec Co. Plant No. 1	Yokohama	35 27-139 37	S	S					X									
78	Nirada Firecracker Factory	Yokohama	35 26-139 36	M	S	X													
80	Nugata Sulphuric Acid Co.	Yokohama	35 29-139 40	M	S		X												
87	Ogura Oil Co.	Yokohama	35 29-139 40	S	P											X			
88	Japan-American Oil Co.	Yokohama	35 29-139 39	M	S											X			
89	Eastern Petroleum Refinery	Yokohama	35 29-139 41	M	S											X			
90	Oriental Oil Co.	Yokohama	35 29-139 40	M	S											X			
92	Lighthouse Bureau Oil Tanks; Kanagawa Gas Tanks	Yokohama	35 26-139 40	M	M											X			
94	Matsukata Oil Storage	Yokohama	35 29-139 40	M	M											X			

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav E/Ship Yds	Non F Metals	Petroleum	Wwy Trans	OTHER
102	Asahi Substation	Yokohama	35 32-139 39	M	M						X								
104	Nippon Power Transforming Station	Kawasaki	35 32-139 40	M	M						X								
105	Kawasaki Substation No. 1	Kawasaki	35 32-139 41	M	M						X								
106	Railroad Transformer Station	Kawasaki	35 32-139 40	M	M						X								
109	Oki Elec Co. Ltd - Plant No. 2	Kawasaki	35 30-139 42	S	S					X									
110	Tokyo Power Gener Sta - Tsurumi Plant	Kawasaki	35 29-139 43	S	P						X								
111	Kawasaki Power Plant	Kawasaki	35 30-139 43	S	P						X								
112	Tsurumi Shunting Yard	Kawasaki	35 32-139 41	S	P													X	
116	Mitsubishi Oil Refinery	Kawasaki	35 30-139 44	P	P											X			
117	Mitsubishi Oil Co. & Chiyoda Oil Tanks	Yokohama	35 29-139 41	S	S											X			
122	Tsurumi Steel & Ship Building Co.	Yokohama	35 29-139 42	S	P									X					
127	Hayama Petroleum Refinery	Kawasaki	35 30-139 44	P	P											X			
128	Petroleum Center	Kawasaki	35 29-139 42	P	P											X			
129	Nippon Super Fuel Co.	Yokohama	35 30-139 41	M	S											X			
130	Asaishi Petroleum Co.	Kawasaki	35 30-139 43	M	S											X			
★133	Shibaura Engineering Works, Ltd.	Yokohama	35 29-139 42	P	P	X			X				X						
134	Asahi Glass Co.	Yokohama	35 29-139 41	M	S		X												
135	Cooperative Auto Works	Kawasaki	35 30-139 42	M	S								X						
136	Fuji Elect Works	Kawasaki	35 30-139 42	M	S				X										
137	Showa Fertilizer	Kawasaki	35 30-139 44	S	P		X												
141	Yokohama Rubber Co.	Yokohama	35 30-139 41	P	P														X Rubber
142	Arms Plant	Kawasaki	35 32-139 45	M	S	X													

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
147	Aikoku Petroleum Refinery	Kawasaki	35 30-139 43	M	S												X		
191	Mitsubishi Coal Depot	Kawasaki	35 30-139 43	M	P							X							
201	Ordnance Storehouse Ammunition	Oji, Tokyo	35 46-139 43	M	M		X												
202	Army Central Clothing Depot	Oji, Tokyo	35 46-139 43	S	S		X												
203	Ordnance Supply Depots (Powder Magazines)	Oji, Tokyo	35 45-139 43	M	S		X												
204	Japan Artificial Fertilizer	Tokyo	35 45-139 45	S	P			X											
205	Army Arsenal & Military Gunpowder Works	Itabashi, Tokyo	35 45-139 43	S	S		X												
206	Army Arsenal	Oji, Tokyo	35 45-139 44	S	S		X												
207	Military Gun Powder Works	Oji, Tokyo	35 45-139 45	M	S		X												
208	Army Branch Powder Factory	Oji, Tokyo	35 45-139 45	M	S		X												
209	Military Works	Oji, Tokyo	35 45-139 44	M	S		X												
211	Inawashiro Transforming Station	Tokyo	35 44-139 46	M	M						X								
212	Asahi Electro Chemical Co.	Tokyo	35 44-139 47	S	P											X			
217	Powder Factory	Oji, Tokyo	35 46-139 43	M	M		X												
218	Ordnance Storehouse	Oji, Tokyo	35 46-139 43	M	M		X												
219	Powder Magazine	Oji, Tokyo	35 45-139 43	M	M		X												
224	Tabata-Nippori RR Yards	Tokyo	35 44-139 46	S	S													X	
230	Senju Steam Power Station	Tokyo	35 45-139 48	M	S						X								
274	Shipyard - Yokosuka Naval Base	Yokosuka	35 17-139 40	P	P									X					
276	Experimental Labs & Ordnance Plants	Yokosuka	35 17-139 40	P	P									X					
277	Refitting Berths BBs & CAs	Yokosuka	35 17-139 41	S	S									X					
282	Yokosuka Arsenal & Armaments Works	Yokosuka	35 18-139 38	P	P	X													

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Ammo	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
295	Yokosuka RR Station Oil Tanks	Yokosuka	35 17-139 38	M	S												X		
296	Mine & A/C Stores	Yokosuka	35 18-139 38	M	M		X												
297	Nako Point Oil Tanks	Yokosuka	35 18-139 39	P	P												X		
298	Oppama Naval Air Station	Yokosuka	35 19-139 39	S	P														Major Air Base
326	Nippon Electric Co Factory No. 2	Tokyo	35 39-139 45	P	P					X									
327	Mitsubishi Aircraft Shibaura Plant	Tokyo	35 38-139 45	P	P	X													
328	Watanabe Steel Works	Tokyo	35 34-139 45	M	S								X						
330	Ishikawajima DockYard	Tokyo	35 40-139 47	P	P										X				
331	Tokyo Gas & Electric Engineering (Tokyo Gasu Denki)	Tokyo	35 35-139 44	P	P	X													
332	Nakajima Seaplane Works	Tokyo	35 36-139 45	S	S	X													
334	Nisso Steel Mfg. Co.	Tokyo	35 41-139 50	M	S								X						
336	Japan Special Steel Co.	Tokyo	35 35-139 45	M	M								X						
337	Haneda Airport	Tokyo	35 34-139 46	M	S														A/Dir A/C Factory
350	Tsukishima Machinery Co.	Tokyo	35 39-139 47	M	S										X				
352	Army Arsenal & Engineering School	Koishikawa, Tokyo	35 42-139 45	M	S		X												
354	Shibaura Machine Tool Co.	Tokyo	35 39-139-46	S	P								X						
355	Army Provisions Depot	Tokyo	35 40-139 48	M	S		X												
☆356	Nakajima Aircraft, Ogikubo Plant	Tokyo	35 42-139 37	P	P	X													
☆357	Nakajima Aircraft, Musashina Plant	Tokyo	35 43-139 35	P	P	X													
359	Uibar Oil Co.	Tokyo	35 42-139 50	M	S											X			
360	Edogawa Petroleum Refinery	Tokyo	35 40-139 53	M	S											X			
364	Shinagawa Railroad Yards	Tokyo	35 38-139 45	S	P												X		

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TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Meh Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
365	Shiodome Freight Yards	Tokyo	35 40-139 46	M	S													X	
366	Steam Engineering & Rolling Stock Mfg. Co.	Tokyo	36 40-139 40	S	S		X											X	
367	Tokyo Central Station	Tokyo	35 41-139 46	M	M													X	
368	Aeronautical Instruments	Tokyo	35 36-139 41	S	P	X													
369	Ueno RR Station	Tokyo	35 42-139 47	M	S													X	
370	Oi Railroad Works	Tokyo	35 37-139 44	P	P													X	
475	Asano Cement Co.	Kawasaki	35 31-139 43	M	S														Cement
479	Japan Artificial Fertilizer	Kawasaki	35 30-139 42	S	P			X											
481	Tokyo Gas Co. - Tsurumi Branch	Kawasaki	35 30-139 42	M	P			X											
484	Showa Wire Cable Co.	Kawasaki	35 32-139 43	M	S				X										
485	Fuji Spinning Mills	Kawasaki	35 32-139 43	M	S														Textiles
487	Meiji Sugar Factory	Kawasaki	35 32-139 42	M	M			X											Sugar-Alcohol
★488	Tokyo-Shibaura Elec Co - Factory No. 2	Kawasaki	35 32-139 42	P	P				X										
489	Nippon Elec Wire & Cable Co.	Kawasaki	35 32-139 42	M	S				X										
493	Tokyo Steam Power Plant	Kawasaki	35 30-139 43	S	P						X								
494	Tokyo Elec Wire & Mfg Co	Kawasaki	35 31-139 42	M	M				X										
★496	Tokyo-Shibaura Elec Co. - Factory No. 1	Kawasaki	35 32-139 42	P	P				X										
★497	Nippon Electric Co - Factory No. 1	Kawasaki	34 34-139 40	P	P				X										
498	Kurada Iron Works (Kurada Gumi)	Yokohama	35 29-139 39	M	S	X													
499	Nippon Carbon Co. Factory No. 1	Yokohama	35 29-139 39	M	M		X												
515	Three Powder Magazines	Yokohama	35 26-139 36	M	M	X													
516	Powder Magazine	Yokohama	35 26-139 37	M	M	X													

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521	Japan (Showa) Electro Chemical Co.	Yokohama	35 29-139 40	S	P											X			
522	Nissan Auto Co.	Yokohama	35 29-139 40	P	P														Autos
523	Japan Radio & Phonograph Co.	Yokohama	35 29-139 40	P	P					X									
539	NaKajima Aircraft, Tanashi Foundry	Tokyo	35 44-139 35	P	P	X													
541	Oriental Otis Elevator Co. (Toyo Otis KK)	Tokyo	35 33-139 43	S	P		X												
551	Medensha Elec Equip Co-Factory No. 1	Tokyo	35 37-139 44	S	P					X									
573	Miyata Engineering works	Tokyo	35 33-139 43	S	P	X													Vehicles
791	Showa Aircraft	Tokyo	35 43-139 22	S	S	X													
792	Tachikawa Aircraft	Tachikawa	35 42-139 24	S	S	X													
799	Mitsubishi Aircraft, Oimachi Plant	Tokyo	35 36-139 44	P	P	X													
826	Fujikura Elec Cable Works	Tokyo	35 40-139 48	M	S					X									
880	Konishi Photo Works	Tokyo	35 41-139 42	M	S		X							X					Phote Equip
882	Ikegai Machine Foundry	Tokyo	35 39-139 45	M	S									X					
883	Ikegai Motor Plant	Tokyo	35 39-139 45	M	S														Motors
885	Takeshiba Pier	Tokyo	35 39-139 46	M	M							X							
886	Hinode-Cho Pier	Tokyo	35 39-139 46	M	M							X							
887	Shibaura Wharf	Tokyo	35 38-139 46	M	P							X							
888	Oki Elec Co, Ltd - Plant No. 1	Tokyo	35 38-139 45	S	P					X									
889	Nippon Elec Co - Factory No. 3	Tokyo	35 38-139 45	M	S					X									
894	Imperial Government Railway Shops	Omiya	35 56-139 38	P	P												X		
898	Japan Military Goods Explovives Plant	Tomioka	35 21-139 38	M	M	X													
899	Japan Military Goods Co.	Tomioka	35 22-139 38	M	M	X													

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904	Sakurada Engineering Works	Tokyo	35 41-139 51	M	S								X						
907	Tokyo Gas Co - Sunamachi Branch	Tokyo	35 41-139 48	M	S			X											
910	Rising Sun Petroleum Terminal	Tokyo	35 42-139 49	M	S											X			
911	Ogura Oil Co.	Tokyo	35 41-139 49	P	P											X			
912	Nisshin Spinning Mill	Tokyo	35 42-139 49	M	S														Textiles
913	Hattori Co.	Tokyo	35 42-139 49	S	P									X					
914	Oriental Weaving Co. Plants	Tokyo	35 41-139 50	M	S														Textiles
915	Oriental Weaving Co. Plants	Tokyo	35 41-139 50	M	S					X				X					Textiles
916	Hitachi Engineering - Kameido Plant	Tokyo	35 42-139 50	P	P														
918	Niigata Iron Works	Tokyo	35 34-135 43	S	P					X				X					
919	Tokyo Measuring Instrument Works	Tokyo	35 34-139 44	P	P	X													
1331	Kayaba Engineering Co.	Tokyo	35 38-139 46	S	S		X												
1332	Rolling Stock Co.	Tokyo	35 34-139 43	S	S		X												
1333	Nippon Typewriter Co.	Tokyo	35 40-139 41	M	S		X												
1334	Asano Karite Co, Ltd.	Yokohama	35 27-139 35	M	M		X												
1335	Naval Gunpowder Works	Oji, Tokyo	35 44-139 45	M	M		X												
1336	Navy Arsenal	Hiratsuka	35 20-139 21	M	S		X												
1337	Tsurumi Army & Navy Stores	Yokohama	35 29-139 41	M	M		X												
1338	Storage Docks	Yokohama	35 26-139 40	M	M		X												
1339	Ammunition Storage	Yokohama	35 25-139 37	M	M		X												
1340	Harley-Davidson Motorcycle Co.	Tokyo	35 40-139 45	M	S														Vehicles
1341	Rikuo Engine Co.	Tokyo	35 36-139 44	M	S														Vehicles

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Ams	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mech/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1342	Japan Machine Industry	Tokyo	35 42-139 49	M	S								X						
1343	Ishikawajima Motor Co.	Yokohama	35 29-139 42	S	P														Vehicles
1344	Japan Auto Co.	Tokyo	35 42-139 41	S	P														Vehicles
1347	Japan Service Co.	Kawasaki	35 32-139 44	M	M														Vehicles
1348	Toho Steel Foundry Co.	Tokyo	35 46-139 41	M	S								X						
1349	Japan Special Steel Works	Tokyo	35 40-139 50	M	M								X						
1350	Tokyo Kozai Co.	Tokyo	35 41-139 50	M	M								X						
1351	Tokyo Nakayama Iron Works	Kawasaki	35 30-139 42	M	M								X						
1352	Steel Plants - Nejoto Ku	Tokyo	35 41-139 51	M	M								X						
1353	Niigata Iron Works	Urawa	35 52-139 39	M	S								X						
1354	Oriental Babcock Co	Yokohama	35 25-139 38	S	P									X					
1355	Japan Steel Bearing Co.	Tokyo	35 37-139 44	P	P									X					
1356	Japan Steel Bearing Co.	Fujisawa	35 21-139 29	P	P									X					
1357	Tokyo Special Machine Mfg Co	Tokyo	35 34-139 41	S	P									X					
1358	Riken Heavy Industry Co	Tokyo	35 46-139 43	S	P									X					
1359	Nippon Piston Ring Co.	Kawaguchi	35 47-139 45	M	M									X					
1360	Ishii Iron Works Ltd	Tokyo	35 32-139 43	M	M									X					
1361	Kokusan Machinery Co.	Tokyo	35 39-139 43	P	P									X					
1362	Kitashin Electric Engineering Co.	Tokyo	35 34-139 42	M	S									X					
1363	Shoun Engineering Co. Ltd	Ofuna	35 21-139 32	M	M									X					
1364	Physico-Chemical Industries, Ltd	Tokyo	35 43-139 45	M	S									X					
1365	Japan Bakelite Co.	Tokyo	35 43-139 49	M	S		X												

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Ams	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Ahs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Wwy Trans	OTHER
1366	Nippon Oil Co.	Tokyo	35 44-139 49	M	M												X		
1367	Tama River Bridges, Tokaido & Keihin Elec Lines	Kawasaki	35 32-139 43	M	S													X	
1368	Akabane Railroad Bridge & Junction	Tokyo	35 46-139 44	M	S													X	
1369	Tsurumi Rivers Bridges of Taksido Main Line	Kawasaki	35 31-139 41	M	S													X	
1370	Sumida River Bridge, RR Yard - Joban Line	Tokyo	35 44-139 48	M	S													X	
1371	Arakawa River Bridges - Joban & Tobu RRs	Tokyo	35 45-139 49	M	S													X	
1372	Sumida River Bridge; Ryogoku Sta & RR Yard	Tokyo	35 41-139 48	M	S													X	
1373	Sobu RR Bridge, Shinkoiwa Yard, Jc	Tokyo	35 43-139 51	M	S													X	
1374	Shinjuku Sta & RR Junctions	Tokyo	35 41-139 43	M	S													X	
1375	Hachioji Junctions & Bridge	Hachioji	35 39-139 20	M	S													X	
1376	Junction	Ofuna	35 21-139 32	M	M													X	
1377	Sagami (Banyu)River Bridge	Hiratsuka	35 20-139 22	M	S													X	
1390	Hitachi-Solex Aircraft	Totsuka	35 24-139 32	M	M	X													
1391	Ishikawajima Engine Plant	Tomioka Yokohama	35 22-139 38	S	P	X													
1392	Yokosuka Naval A/C Factory & Research	Yokosuka	35 18-139 38	M	S	X	X												
1393	Aeronautical Experimental Laboratory	Tokyo	35 40-139 41	M	S	X													
1394	Kanegafuchi Spinning Mill Co.	Tokyo	35 44-139 49	M	M	X													
1395	Shoda Aircraft	Tokyo	35 41-139 35	M	S	X													
1396	Tsurumi Soda Co.	Yokohama	35 29-139 41	M	M			X											
1397	Japan Refining Works	Tokyo	35 41-139 51	M	S			X											
1398	Tokyo Gas Co - Omori Branch	Tokyo	35 34-139 45	M	S			X											
1399	Hodogaya Soda	Yokohama	35 27-139 36	M	S			X											

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1400	Hodogaya Soda	Tokyo		M	S			X											
1401	Japan Artificial Fertilizer	Tokyo	35 41-139 51	M	M			X											
1402	Yokohama Naval Air Station	Yokohama	35 25-139 38	M	S														Navy A/D
1404	Tachikawa Air Base	Tachikawa	35 42-139 25	S	P														Army A/B
1405	Sunamachi Airport	Tokyo	35 39-139 50	M	S														A/D
1406	Tokorazawa Airport	Tokyo	35 48-139 29	M	M														Trng & Rprs
1413	Shinagawa Air Base	Tokyo	35 36-139 45	M	M														Trng & Rprs
1418	Marunouchi Telephone Exchange	Tokyo	35 41-139 46	S	P														Communications
1419	Navy Dept Towers	Tokyo	35 40-139 45	M	M														Communications
1420	Funabashi Naval Transmitting Sta	Tokyo	35 41-140 00	S	S														Communications
1421	Midensha Elec Equip Co-Factory No. 2	Tokyo	35 33-139 46	S	P					X									
1422	Komura Radio Telephone Station	Tokyo	35 58-139 38	M	M														Communications
1423	Fukuoka Wireless Station	Tokyo	35 53-139 31	M	M														Communications
1424	Central Meteorological Observatory	Tokyo	35 39-139 45	M	M														Weather Station
1428	Yokohama Telephone Exchange No. 1	Yokohama	35 27-139 39	M	S														Communications
1429	Odawara Telephone Repeater Station	Tokyo	35-15-139 20	M	S														Communications
1430	Nippon Elec Wire & Cable Co.	Tokyo	35 43-139 49	M	S					X									Communications
1431	The Bridgestone Tire Co.	Totsuka	35 24-139 32	S	P														Rubber
1432	Yokohama Harbor Passenger Wharves	Yokohama	35 27-139 39	M	M						X								
1433	Yokohama Main Pier	Yokohama	35 27-139 39	M	M						X								
1434	Fukagawa Pier	Tokyo	35 39-139 48	M	M						X								
1435	Tsukishima Pier	Tokyo	35 39-139 47	M	M						X								

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TARGET NO	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1436	Tsukishima East Wharf	Tokyo	35 39-139 47	M	M							X							
1437	Mitsubishi Piecegoods Wharf & Whses	Kawasaki	35 30-139 43	M	M							X							
1438	Kyoritsu Warehouse	Yokohama	35 27-139 38	M	M							X							
1439	Yokohama Central Wholesale Market	Yokohama	35 28-139 38	M	M							X							
1440	Mitsubishi Warehouse	Yokohama	35 27-139 39	M	S							X							
1441	Yokohama Warehouse - North	Yokohama	35 29-139 40	M	M							X							
1442	Yokohama Warehouse - South	Yokohama	35 28-139 39	M	M							X							
1444	Yokohama Harbor Timber Basin	Yokohama	35 26-139 40	M	M							X							
1445	Yokohama Harbor Coop. Purchasing Co. Whses	Yokohama	35 29-139 39	M	M							X							
1446	East Asia Development Co. Whses	Yokohama	35 29-139 39	M	M							X							
1447	Hiraidzume Drug Depot	Yokohama	35 29-139 40	M	S							X							
1448	Tsukiji Market & Wholesale Whse	Tokyo	35 40-139 46	M	S							X							
1449	Kanda Market	Tokyo	35 42-139 47	M	S							X							
1450	Koto Market	Tokyo	35 41-139 48	M	S							X							
1453	Gunnery & Navigation Schools	Yokosuka	35 18-139 40	M	M										X				
1454	Kakiga Drydock	Yokosuka	35 18-139 40	M	S										X				
1455	Oyama Point Ammunition & Power Stores	Yokosuka	35 18-139 38	M	M	X													
1456	Torpedo & Wireless School	Yokosuka	35 18-139 38	M	S										X				
1457	Montonaga Inlet Oil Tanks	Yokosuka	35 18-139 39	S	P											X			
1458	Yokosuka Naval Radio	Yokosuka	35 17-139 40	M	M														Communications
1459	Susaki Dockyard	Tokyo	35 39-139 48	M	S									X					
1460	Uraga Dockyard, No. 1	Yokosuka	35 15-139 43	P	P									X					

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	Elec Eqp/Radar	Elec Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Ry Trans	OTHER
1461	Uraga Dockyard, No. 2	Yokosuka	35 15-139 43	S	S										X				
1462	Shinagawa Shipyard	Tokyo	35 36-139 45	M	S										X				
1485	South Manchurian Wharf & Warehouses	Kawasaki	35 30-139 44	M	M							X							
1486	Old Aircraft Center	Yokosuka	35 18-139 38	M	S	X													
1493	Toshin & Shinko Warehouses	Yokohama	35 27-139 39	M	M							X							
1640	Japan Steel Bearing Co.	Tokyo	35 34-139 41	S	P									X					

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JAPAN PROPER 90 SHIZUOKA 90.18

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Nbs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
★1176	Japan Light Metals Alumina Plant	Shimizu	35 00-138 38	P	P											X			
★1177	Japan Light Metals Aluminum Plant	Kambara	35 07-138 38	P	P											X			
1181	Numazu RR Yards	Numazu	35 06-138 52	S	P													X	
1604	Inako Hydro Plant	Fuji River	35 14-138 30	S	S						X								

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JAPAN PROPER 90 NAGOYA 90.20

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Equ/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mech/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Ry Trans	OTHER
★193	Mitsubishi Aircraft Engine Works	Nagoya	35 11-136 57	P	P	X													
★194	Mitsubishi Aircraft Works	Nagoya	35 05-136 54	P	P	X													
195	Nagoya # 1 Steam Power Plant	Nagoya	35 05-136 54	S	P						X								
196	Chigusa Factory of Nagoya Arsenal	Nagoya	35 10-136 57	S	S		X												
197	Atsuta Factory of Nagoya Arsenal	Nagoya	35 08-136 55	P	P		X												
★198	Aichi Aircraft Works, Atsuta Plant	Nagoya	35 07-136 54	P	P	X													
199	Aichi Aircraft Works, Mizuho Plant	Nagoya	35 08-136 54	S	P	X													
★240	Kawasaki Aircraft Works, Kagamigahara Plant	Gifu	35 24-136 52	P	P	X													
241	Nippon Vehicle Manufacturing Co.	Nagoya	35 07-136 55	S	P		X												
242	Okamoto Aircraft Works, Showa Plant	Nagoya	35 06-136 54	S	S	X													
247A	Daido Electric Co, Oe Plant	Nagoya	35 05-136 54	S	S								X						
247B	Daido Electric Co, Atsuta Plant	Nagoya	35 07-136 55	P	P								X						
247C	Daido Electric Co, Tsukiji Plant	Nagoya	35 05-136 54	S	S								X						
247D	Daido Electric Co, Minami Plant	Nagoya	35 04-136 55	P	P								X						
249	Kagamigahara Military Airport	Gifu	35 23-136 53	S	P	X													
250A	Nagoya Freight Yards	Nagoya	35 09-136 53	S	P												X		
250B	Nagoya Repair Shops	Nagoya	35 09-136 52	S	P												X		
250C	Nagoya Station	Nagoya	35 10-136 53	M	S												X		
251	Nagoya Harbor	Nagoya	35 05-136 53	S	P							X							
253	Nissan Chemical Plant	Nagoya	35 05-136 52	M	S			X											
★254	Mitsubishi Electrical Mfg Co.	Nagoya	35 11-136 57	P	P				X				X						
255	Yahugi Electro Chemical Plant	Nagoya	35 05-136 54	S	S		X												—

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TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
430	Toyoda Machinery Manufacturing Co.	Nagoya	35 11-136 53	S	P	X													
456	Toko Gas Works Synthetic Oil Plant	Nagoya	35 08-136 55	S	S											X			
461	Okuma Iron Works Ozore Plant	Nagoya	35 11-136 56	S	S									X					
467	Showa Soda Plant	Nagoya	35 04-136 54	M	S			X											
1129	Okamoto Aircraft Works, Kasadera Plant	Nagoya	35 05-136 56	S	S	X													
1130	Suzuka Naval Air Base	Kanbe	34 55-136 39	S	P	X													
1133	Inasawa Shunting Yards	Inasawa	35 14-136 50	S	P													X	
1138	Nippon Explosives Works	Taketago	34 51-136 55	S	S		X												
☆1139	Toyoda Automobile Works, Koroma Plant	Koromo	35 03-137 09	P	P	X													
1140	Toyoda Automobile Works, Kariya Plant	Kariya	34 52-137 01	P	P	X													
1141	Toyoda Heavy Industry Co., Shinkawa Plant	Nagoya	35 12-136 51	S	P	X													
1143	Iwakura Transformer Station	Kachikawa	35 16-136 52	S	S						X								
1144	Seto Hydro Station	Shimohara	33 45-137 13	M	M						X								
1146	Okuma Iron Works, Hagino Plant	Nagoya	35 12-136 55	P	P								X						
1147	Okuma Iron Works, Munoike Plant	Nagoya	35 10-136 56	S	S								X						
1153	Jaron Porcelain Company	Nagoya	35 11-136 53	M	S														Firebricks
1171	Nippon Insulator Company	Nagoya	35 08-136 55	S	S														Firebricks
1598	Nagoya # 2 Steam Power Plant (Meiko Plant)	Nagoya	35 05-136 52	S	P					X									
1635	Nakajima Aircraft Works	Handa	34 53-136 57	S	S	X													
1638	Inayama Transformer Station	Gifu	35 21-136 58	S	P					X									
1639	Sumitomo Duralumin Mill, Kuwana Plant	Kuwana	35 04-236 41	P	P										X				
1729	Aichi Aircraft Works, Eitoku Plant	Nagoya	35 05-136 51	S	P	X													

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1730	Aichi Aircraft Works, Bomimura Plant	Koromo	35 07-137 08	S	S	X													
1735	Toyowa Heavy Industry Co, Nishe Plant	Nagoya	35 10-138 53	S	S	X													
1736	Okamoto Aircraft Works, Tarui Plant	Tarui	35 22-136 32	S	P	X													
1737	Yokkaichi Harbor	Yokkaichi	34 57-136 38	M	S							X							
1738	Toho Heavy Industry	Yokkaichi	34 58-136 39	M	S								X						
1753	Kobe Steel Works, Nagoya Plant	Nagoya	35 12-136 55	S	P	X										X			
1776	Ishihara Smelter & Refinery	Yokkaichi	34 56-136 39	S	S											X			
1779	Yamamoto Heavy Industry	Kuwana	35 03-136 42	M	S								X						
1797	Okuma Iron Works, Kami Jida Cho Plant	Nagoya	35 12-136 56	S	S									X					
1798	Osaka Machinery Works	Nagoya	35 07-136 55	M	S									X					
1799	Hokoku Machinery Co. Kasadera Plant	Nagoya	35 05-136 55	M	S									X					
1800	Daido Machinery Plant, Showa Plant	Nagoya	35 05-136 54	S	P									X					
1802	Hitachi Works	Kuwana	35 03-136 41	M	S									X					
1803	Meidensha Electric Manufacturing Co.	Heisaka	34 51-137 01	S	S					X									
1805	Okuma Iron Works, Kusunoki Plant	Kachikawa	35 13-136 56	S	S									X					
1806	Okuma Iron Works, Kachikawa Plant	Kachikawa	35 14-136 57	M	S									X					
1808	Meidensha Electric Mfg Co, Nishi Biwajima Plant	Nagoya	35 12-136 52	S	S				X										
1809	Hokoku Machinery Co., Atsuta Plant	Nagoya	35 08-136 54	M	S									X					
1810	Ogaki Iron Works	Ogaki	35 22-136 39	M	S									X					
1811	Ogaki Iron Works	Gifu	35 24-136 53	M	S									X					
1812	Kagamigahara Machinery Works	Gifu	35 24-136 52	M	S									X					
1813	Koa Machinery Company	Tomita	35 01-136 39	M	S									X					

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1814	Tokyo Shibaura Electric Mfg Co.	Kuwana	35 02-136 40	S	S					X									
1815	Toyo Bearing Company, Dojima Plant	Kuwana	35 04-136 41	P	P									X					
1816	Toyo Bearing Company, Uchibou Plant	Kuwana	35 03-136 42	P	P									X					
1818	Tokushu Light Metals Co, Atsuta Plant	Nagoya	35 05-136 54	S	S											X			
1819	Tokushu Light Metals Co, Ogaki Plant	Ogaki	35 22-136 37	S	S											X			
1820	Tokushu Light Metals Co, Inasawa Plant	Inasawa	35 15-136 47	S	S											X			
1821	Riken Alunite Plant	Nagoya	35 13-136 55	S	S											X			
1822	Jbigawa Electro-Chemical Co, Kido Plant	Ogaki	35 21-136 36	M	S			X											
1823	Tokai Electrode Co, Nagoya # 1 Plant	Nagoya	35 08-136 55	M	S														Electrodes
1824	Tokai Electrode Co. Nagoya # 2 Plant	Nagoya	35 06-136 55	M	S														Electrodes
1825	Tokai Electrode Co, Nagoya # 3 Plant	Nagoya	35 06-136 55	M	S														Electrodes
1826	Nippon Synthetic Chemicals Plant	Ogaki	35 21-136 37	M	S			X											
1827	Dai Nippon Cellophane Plant	Nagoya	35 12-136 55	M	S			X											
1828	Aichi Aircraft Works, Tsukiji Plant	Nagoya	35 05-136 53	S	S	X													
1829	Yakagi Steel Plant	Nagoya	35 04-136 54	M	S								X						
1830	Toyoda Steel Plant	Yokosuka	35 02-136 55	M	S								X						
1831	Hirano Loom Works, Nakagawa Plant	Nagoya	35 07-136 53	M	S									X					
1832	Jbigawa Electro-Chemical Co, Kita Kiriishi Plant	Ogaki	35 21-136 37	M	S			X											
1833	Mitsubishi Aircraft Works, Kagamigahara Plant	Gifu	35 24-136 51	P	P	X													
1834	Nakajima Aircraft Plant	Komono	35 07-137 09	S	S	X													

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JAPAN PROPER 90 HAMAMATSU 90.21

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Veh Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1219	Japan Musical Instrument Co.	Hamamatsu	34 43-137 44	P	P									X					
1224	Toyohashi Army Arsenal	Toyohashi	34 44-137 23	M	S		X												
1227	Suzuki Loom Works	Hamamatsu	34 42-137 45	M	S		X							X					
1230	Imperial Government Railway Shops	Hamamatsu	34 43-137 43	S	P													X	
1653	Toyokawa Naval Arsenal	Toyokawa	34 49-137 24	S	P		X												
1929	Suzuki Loom Works, Takatsuka Plant	Takatsuka	34 41-137 41	M	S		X							X					

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
2	Tsuruga Cement Co.	Tsuruga	35 40-136 05	M	S														Cement
1032	Wharf 1	Tsuruga	35 40-136 05	M	S							X							
1033	Wharf 2	Tsuruga	35 40-136 05	M	S							X							
1034	Wharf 3	Tsuruga	35 39-136 04	M	S							X							
1039	Drydocks	Maizuru	35 29-135 22	P	P										X				
1040	Naval Arsenal	Maizuru	35 29-135 22	P	P		X												
1041	Building Slips	Maizuru	35 29-135 22	P	P										X				
1043	Oil Tanks	Maizuru	35 29-135 22	M	S												X		
1044	Maizuru Docks & Harbor Facilities	Maizuru	35 27-135 20	M	S							X							

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1155	Uji Hydro Plant	Uji River	34 53-135 49	M	S						X								
1156	Shizugawa Hydro Plant	Uji River	34 52-135 50	M	S						X								
1159	Kyoto RR Sta, Junction & Yards	Kyoto	34 59-135 46	S	P													X	
1160	Maibara RR Junction	Maibara	35 19-136 18	M	S													X	
1167	International Aeronautical Industrial Co.	Fushimi	34 57-135 46	M	S	X													

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JAPAN PROPER 90 KUMANO 90.24

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Mnns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1213	Akeno Military Aviation School & a/D	Ujiyamada	34 32-136 40	M	S														Training
1214	Arsenal	Hisai	34 40-136 29	M	S		X												
1215	Kobe Steel Co.	Toba	34 28-136 51	S	P					X									
1216	Toba Dockyard	Toba	34 28-136 51	S	P										X				

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JAPAN PROPER 90 OSAKA 90.25

TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
4	Minitogawa Steam Power Plant	Kobe	34 39-135 09	M	S						X								
☆ 5	Kobe Steel Works	Kobe	34 42-135 13	P	P								X						
☆ 6	Kobe Steel Works	Kobe	34 42-135 13	P	P								X						
☆ 7	Kawasaki Heavy Industry	Kobe	34 42-135 13	P	P								X						
11	Kawasaki Locomotive & Car Co	Kobe	34 39-135 10	S	P													X	
14	Nippon Dunlop Rubber Co.	Kobe	34 42-135 13	P	P														Rubber
17	Rising Sun Petroleum Oil Storage	Kobe	34 39-135 09	M	S												X		
☆ 18	Kawanishi Aircraft Co.	Naruo	34 42-135 22	P	P	X													
22	Kobe Harbor District No. 1	Kobe	34 41-135 12	P	P							X							
34	Kobe Harbor District No.2	Kobe	34 40-135 11	S	P							X							
53	Osaka Harbor	Osaka	34 39-135 26	P	P							X							
153	Senkari Reservoir Dam	Senda	34 52-135 16	M	S					X									
157	Sannomiya Railroad Station	Kobe	34 41-135 12	S	P													X	
★169	Mitsubishi Heavy Industries	Kobe	34 39-135 11	P	P										X				
171	Kawasaki Heavy Industry Dockyard	Kobe	34 40-135 11	P	P										X				
257	Maruzen Oil Refinery & Toyo Oil Refinery	Osaka	34 38-135 28	S	S											X			
258A&B	Mitsubishi Oil Storage	Osaka	34 38-135 28	M	S												X		
260	Rising Sun Petroleum Oil Storage	Osaka	34 38-135 29	M	S												X		
261	Standard Vacuum & Nippon Oil Storage	Osaka	34 40-135 27	M	S												X		
262	Sumitomo Electric Industries Co.	Osaka	34 41-135 27	P	P					X									
★263A	Sumitomo Metal Industry & Aluminum Co.	Osaka	34 40-135 27	P	P										X				
263B	Sumitomo Metal Industry & Aluminum Co.	Osaka	34 41-135 29	P	P										X				

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JAPAN PROPER 90 OSAKA 90.25

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
4	Minitogawa Steam Power Plant	Kobe	34 39-135 09	M	S						X								
☆ 5	Kobe Steel Works	Kobe	34 42-135 13	P	P								X						
☆ 6	Kobe Steel Works	Kobe	34 42-135 13	P	P								X						
☆ 7	Kawasaki Heavy Industry	Kobe	34 42-135 13	P	P								X						
11	Kawasaki Locomotive & Car Co	Kobe	34 39-135 10	S	P													X	
14	Nippon Dunlop Rubber Co.	Kobe	34 42-135 13	P	P														Rubber
17	Rising Sun Petroleum Oil Storage	Kobe	34 39-135 09	M	S											X			
☆ 18	Kawanishi Aircraft Co.	Naruo	34 42-135 22	P	P	X													
22	Kobe Harbor District No. 1	Kobe	34 41-135 12	P	P							X							
34	Kobe Harbor District No.2	Kobe	34 40-135 11	S	P							X							
53	Osaka Harbor	Osaka	34 39-135 26	P	P							X							
153	Senkari Reservoir Dam	Senda	34 52-135 16	M	S					X									
157	Sannomiya Railroad Station	Kobe	34 41-135 12	S	P												X		
★169	Mitsubishi Heavy Industries	Kobe	34 39-135 11	P	P									X					
171	Kawasaki Heavy Industry Dockyard	Kobe	34 40-135 11	P	P									X					
257	Maruzen Oil Refinery & Toyo Oil Refinery	Osaka	34 38-135 28	S	S											X			
258A&B	Mitsubishi Oil Storage	Osaka	34 38-135 28	M	S											X			
260	Rising Sun Petroleum Oil Storage	Osaka	34 38-135 29	M	S											X			
261	Standard Vacuum & Nippon Oil Storage	Osaka	34 40-135 27	M	S											X			
262	Sumitomo Electric Industries Co.	Osaka	34 41-135 27	P	P					X									
★263A	Sumitomo Metal Industry & Aluminum Co.	Osaka	34 40-135 27	P	P										X				
263B	Sumitomo Metal Industry & Aluminum Co.	Osaka	34 41-135 29	P	P										X				

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JAPAN PROPER 90 OSAKA 90.25

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
264	Sumitomo Metal Industry	Osaka	34 40-135 27	S	S								X						
268	Osaka Steel Mfg Co.	Osaka	34 42-135 27	S	S								X						
272	Osaka Iron Works Unit No. 1	Osaka	34 40-135 27	S	P										X				
273A	Fujinagata Shipbuilding Co.	Osaka	34 37-135 28	P	P										X				
273B	Fujinagata Shipbuilding Co.	Osaka	34 37-135 28	P	P										X				
322	Kasugade No. 1 Steam Power Plant	Osaka	34 40-135 28	M	S						X								
323	Kasugade No. 2 Steam Power Plant	Osaka	34 40-135 28	M	S						X								
324	Fukuzaki Steam Power Plant	Osaka	34 39-135 28	M	M						X								
325	Kizugawa Steam Power Plant	Osaka	34 37-135 29	S	S						X								
☆382	Osaka Arsenal	Osaka	34 41-135 32	P	P	X													
383	Dai Nippon Celluloid Co.	Osaka	34 36-135 29	S	S		X												
388	Osaka Machinery Co.	Osaka	34 42-135 30	M	S									X					
☆536	Amagasaki Steam Power Plant	Amagasaki	34 42-135 24	P	P						X								
538	I.G.R. Shops	Takatori	34 39-135 08	S	P												X		
☆540A	Kansaikyodo Steam Power Plant No. 1	Amagasaki	34 42-135 24	P	P						X								
☆540B	Kansaikyodo Steam Power Plant No. 2	Amagasaki	34 42-135 24	P	P						X								
548	Rolling Stock Mfg Co.	Osaka	34 40-135 27	M	S		X										X		
661	Amatsuji Steel Ball Mfg Co.	Osaka	34 43-135 28	P	P									X					
685	Kurimoto Iron Works	Osaka	34 39-135 29	M	S								X						
686	Osaka Metal Industry Co.	Osaka	34 39-135 30	S	P	X													
687	Osaka Wakayama Iron Works	Osaka	34 39-135 30	S	S									X					
688	Kubota Iron and Machinery Works	Osaka	34 39-135 30	M	S									X					

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
697	Mitsuibishi Copper Refinery	Osaka	34 42-135 31	P	P											X			
699	Osaka Iron Works Unit No. 2	Osaka	34 38-135 27	S	S										X				
701	Kubota Iron and Machinery Works	Osaka	34 38-135 28	M	S									X					
713	Nakayama Steel Mfg Co.	Osaka	34 37-135 28	S	S								X						
785	Kanegafuchi Soda Industry	Kobe	34 39-135 10	M	S			X											
793	Fukuda Light Airplane Co.	Osaka	34 43-135 27	M	S	X													
1191	Hatsudoki Engine Works	Osaka	34 42-135 29	S	S									X					
1195	Sumitomo Metal Industry	Amagasaki	34 43-135 25	S	S								X						
1197	Kubota Iron & Machinery Works	Amagasaki	34 43-135 25	M	S									X					
1198	Toyo Bearing Mfg Co.	Takarazuka	34 47-135 22	P	P									X					
1203	Nippon Oil Refinery & Tank Farm	Amagasaki	34 42-135 24	S	P											X			
1206	Osaka Railroad Station	Osaka	34 42-135 30	S	P												X		
1209	Suita RR Yards and Shops	Suita	34 46-135 32	P	P												X		
*1547	Kawasaki Aircraft Co.	Akaski	34 39-134 57	P	P	X													
1616	Kujo Steam Power Plant	Osaka	34 40-135 29	M	S					X									
1628	Takeda Drug Co.	Osaka	34 43-135 29	S	P			X											
1629	Amagasaki Transformer Station	Amagasaki	34 45-135 29	S	S					X									
1630	Osaka Transformer Station	Osaka	34 44-135 36	S	S					X									
1631	Yao Transformer Station	Yao	34 37-135 37	S	S					X									
1632	Kizu Transformer Station	Kizu	34 35-135 50	S	S					X									
1634	Mizaguchi Gear Works	Osaka	34 43-135 27	S	S									X					
1702	Kawanishi Aircraft Co.	Fukae	34 43-135 17	S	P	X													

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1703	Toyowa Heavy Industry Co.	Osaka	34 39-135 29	S	P									X					
1704	Strong Engineering Works Co.	Ibaragi	34 49-135 26	M	M	X													
1705	Strong Engineering Works Co.	Osaka	34 42-135 27	M	M	X													
1706	Mizuno Sporting Goods Co.	Osaka	34 42-135 29	M	M	X													
1707	Toyo Metal and Wood Co.	Itami	34 48-135 25	M	M	X													
1708	Nippon Aluminium Works	Osaka	34 44-135 30	M	S											X			
1709	Sumitomo Aluminium Co	Yao	34 47-135 36	M	S											X			
1710	Takada Aluminium Mfg Co.	Sakai	34 35-135 28	M	M											X			
1711	Osaka Shipbuilding Works	Osaka	34 39-135 27	M	S										X				
1712	Osaka Gas Co, Coke Oven Plant	Osaka	34 40-135 29	S	P				X										
1713	Tagi Fertilizer Co.	Bohu	34 43-134 51	M	S			X											
1714	Kwoya Precision Works Co.	Kokubu	34 34-135 38	S	S									X					
1715	Kwoya Precision Works Co.	Osaka	34 39-135 32	S	S									X					
1716	Asahi Precision Work Co.	Sakai	34 31-135 27	M	M									X					
1717	Yuasa Storage Battery Mfg Co.	Takasuki	34 51-135 37	M	S									X					
1718	Kwoya Precision Works Co.	Osaka	34 39-135 33	M	M									X					
1719	Nippon Airbrake Co.	Kobe	34 42-135 13	S	S									X					
1720	Kwoya Precision Works Co.	Osaka	34 39-135 33	M	M									X					
1721	Tanaka Piston Ring Co.	Osaka	34 41-135 31	S	S									X					
1723	Hirakata Branch Osaka army arsenal	Hirakata	34 50-135 40	S	P														Depot
*1724	Kawasaki Aircraft Co.	Akashi	34 39-134 59	P	P	X													
1725	Asano Portland Cement Co.	Osaka	34 28-135 29	M	S														Cement

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JAPAN PROPER 90 OSAKA 90.25

TARGET NO	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Ams	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Wks	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Ry Trans	OTHER
1726	Osaka Ceramic Industry Cement Co.	Osaka	34 38-135 28	M	S											X			
1732	Rasa Industry Co.	Osaka	34 41-135 28	S	S			X											
1733	Japan Dyestuff Mfg (Dye Plant)	Osaka	34 40-135 27	S	P			X											
1734	Japan Dyestuff Mfg. (Drugs Plant)	Osaka	34 41-135 26	S	P			X											
1739	Furukawa Electrical Co.	Amagasaki	34 42-135 25	M	S					X									
1740	Furukawa Electrical Co.	Osaka	34 42-135 31	M	S					X									
1741	Sankyo Co.	Osaka	34 43-135 31	M	S			X											
1743	Dai Nichi Electric Wire Co.	Amagasaki	34 42-135 25	M	S					X									
1744	Matsushita Wireless Co.	Moriguchi	34 44-135 35	M	S					X									
1745	Kawanishi Machine Shop	Kobe	34 39-135 10	M	S					X									
1746	Oki Electric Co.	Osaka	34 42-135 29	M	S					X									
1747	Oki Electric Co.	Kobe	34 41-135 12	M	M					X									
1748	Showa Electrode Co.	Naruo	34 42-135 23	M	M					X									
1750	Matsushita Dry Battery Co.	Moriguchi	34 44-135 34	M	M					X									
1751	Matsushita Dry Battery Co.	Osaka	34 44-135 29	M	S					X									
1752	Osaka Electric Machinery Co.	Osaka	34 37-135 29	S	S					X									
1755	Nakayama Steel Mfg Co.	Osaka	34 39-135 29	S	S					X									
1756	Oriental Cable Co.	Kaji	34 26-135 20	M	M					X									
1760	Asahi Glass Co.	Amagasaki	34 43-135 25	M	S			X											
1761	Nitta Leather Belt Mfg Co.	Osaka	34 39-135 29	M	S														Leather
1762	Kawasaki Heavy Industry	Kobe	34 39-135 09	P	P							X							
1763	Kurimoto Iron Works	Osaka	34 37-135 28	M	M							X							

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JAPAN PROPER 90 OSAKA 90.25

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1764	Maruzen Oil Refinery	Shimotsu	34 06-135 09	S	S												X		
1765	Japan Iron Works	Osaka	34 38-135 29	M	M								X						
1766	Daido Steel Mfg. Co.	Amagasaki	34 43-135 26	S	S								X						
1767	Tokyo Rolling Works	Amagasaki	34 42-135 24	S	S								X						
1768	Kobe Steel Works	Kobe	34 42-135 13	P	P								X						
1769	Amagasaki Steel Works	Amagasaki	34 43-135 24	S	S								X						
1770	Nippon Iron Sand Industry Co.	Takasago	34 45-134 49	M	S								X						
1771	Nakayama Steel Mfg Co.	Amagasaki	34 42-135 25	S	S								X						
1773	Osaka Chain & Machinery Works	Ibarigi	34 49-135 33	S	S									X					
1774	Yamato Steel Works	Osaka	34 38-135 29	S	S								X						
1775	Kawasaki Heavy Industry	Kobe	34 41-135 13	P	P								X						
1777	Kubota Iron and Machinery Works	Sakai	34 33-135 28	M	M									X					
1778	Kubota Iron and Machinery Works	Osaka	34 40-135 28	M	M									X					
1780	Osaka Machinery Co.	Itami	34 47-135 25	S	S									X					
1781	Osaka Machinery Co.	Osaka	34 44-135 28	S	S									X					
1782	Osaka Metal Industry Co.	Sakai	34 34-135 29	M	S									X					
1783	Osaka Makayama Iron Works	Osaka	34 43-135 28	M	S									X					
1784	Osaka Makayama Iron Works	Tsuda	34 22-135 26	M	S									X					
1785	Oriental Can Mfg. Co.	Osaka	34 38-135 28	M	S		X												Containers
1786	Oriental Can Mfg Co.	Osaka	34 42-135 29	M	S		X												Containers
1787	Oriental Can Mfg. Co.	Osaka	34 41-135 29	M	S		X												Containers

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JAPAN PROPER 90 OKAYAMA 90.27 MATSUE 90.26

TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Pwy Trans	OTHER
1280	Nissan Chemical Co.	Ogushi	34 35-134 02	M	S			X											
1281	Dai Nippon Celluloid Co.	Aboshi	34 47-134 36	M	S			X											
1283	Sanyo Power Plant - Shikama No. 3 Plant	Shikama	34 47-134 40	S	P						X								
1284	Chukoku Power Plant	Okayama	34 36-133 59	S	P						X								
1286	Sanyo Power Plants - Shikama No. 1, 2	Shikama	34 47-134 40	M	S						X								
1289	Uno Transport Base	Uno	34 29-133 58	M	S							X						X	
*1290	Nippon Steel Co.	Hirohata	34 47-134 38	P	P								X						
1295	Mitsui Tama Shipyard	Tama	34 28-133 56	P	P										X				
1296	Harima Shipyard	Co	34 47-134 28	P	P										X				
1297	Mitsubishi Copper Smelter & Zinc Refinery	Naoshima	34 28-133 58	M	S											X			
1298	Nippon Sulphur Co - Inushima Refinery	Inushima	34 33-134 06	M	M											X			
1648	Asada Alumina Plants	Shikama	34 47-134 41	M	M											X			
1920	Sanyo Steel Co.	Shikama	34 47-134 41	M	S								X						
1921	Nippon Iron Sand Industry - Shikama Steel Plant	Shikama	34 47-131 41	M	S								X						
1922	Teikoku Mining Co. Hibi Refinery	Hi bi	34 27-133 56	M	S		X									X			

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Nhs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1524	Tosa Cement Plant	Kochi	33 32-133 33	M	S														Cement
1525	Nankai Chemical Plant	Kochi	33 32-133 33	M	M			X											
1530	Kochi Steel Plant	Kochi	33 33-133 33	M	M								X						

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
814	Sumitomo Copper Smelter	Mino	34 06-133 11	S	S											X			
815	Sumitomo Copper Refinery	Niihama	33 58-133 16	S	S											X			
923	Sumitomo Chemical Co.	Niihama	33 58-133 16	S	S			X											
924	Sumitomo Aluminum Reduction Plant	Niihama	33 58-133 17	S	S											X			
925	Niihama Ore Dressing Plant	Niihama	33 58-133 16	M	S											X			
926	Sumitomo Bessi Copper Mine & Hadeba Ore Dressing Plt	Kuroichi	33 53-133 19	M	S											X			
927A	Osaka Iron Wks, Habu Wks, Innoshima Shipyards	Innoshima	34 16-133 11	P	P										X				
927B	Osaka Iron Wks, Shannosho Wks, Inoshima Shipyards	Innoshima	34 16-133 11	P	P										X				
928	Mukaishima Drydock Co.	Onomichi	34 24-133 13	M	S										X				
929	Mihara Shipyards	Onomichi	34 2-133 02	M	S										X				
930	Saizaka Dockyard	Saizaka	34 2-133 02	M	S										X				
931	Niihama Steam Power Plant	Niihama	33 58-133 17	S	P						X								
932	Sumitomo Machinery Works	Niihama	33 58-133 16	M	M									X					
934	Itozaki Oil Storage	Itozaki	34 23-133 07	M	S											X			
1303	Tadotsu RR Yards & Repair Shops	Tadotsu	34 16-133 45	M	P												X		
1602	Saijo Steam Power Plant	Itozaki	34 23-133 07	M	S					X									
1657	Sumitomo Alumina Plant	Niihama	33 58-133 16	S	S											X			
1931	Imperial Dye Works	Fukuyama	34 29-133 22	S	P			X											
1935	Chigiri Shima Copper Smelter	Chigiri Shima	34 18-132 54	M	S											X			
1936	Takehara Electrolytic Copper Refinery	Takehara	34 21-132 55	M	S											X			

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JAPAN PROPER 90 KURE 90.30

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Equ/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
656	Kure Naval Air Station	Hiro	34 14-132 37	M	S														
☆657A	Kure Naval Arsenal	Kure	34 12-132 33	P	P		X								X				Test Field
657B	Kure Naval Shipyard	Kure	34 14-132 33	P	P										X				Military Strs.
657C	Torpedo Boat Depot & Mine Depot	Kure	34 14-132 33	M	S		X								X				
657D	Supply Depot - Food & Clothing	Kure	34 14-132 33	M	S							X							
658	Kure Submarine Base	Kure	34 15-132 22	S	P										X				
659	Kitonose Oil Storage	Yeta Shima	34 12-132 28	P	P											X			
660	Hiro Naval Aircraft Factory	Hiro	34 13-132 37	M	S	X								X					
720	Hiro Naval Engine & Turbine Factory	Hiro	34 13-132 37	P	P							X							
735	Army Transport Base	Ujina	34 21-132 28	S	P														
736	Army Ordnance Depot	Hiroshima	34 23-132 29	M	S		X	X											
737	Army Food Depot	Hiroshima	34 22-132 28	M	S														Stores
738	Army Clothing Depot	Hiroshima	34 22-132 28	M	S														Supply
740	East Hiroshima RR Station	Hiroshima	34 23-132 29	S	S													X	
☆794	Hiro Arsenal	Hiro	34 14-132 37	P	P		X					X							
796	Saka Power Plant	Yano	34 21-132 32	S	P					X									
798	Kure RR Station	Kure	34 14-132 33	M	S													X	
1885	Mitsubishi Electric Mfg Co, Hiroshima Plant	Hiroshima	34 26-132 28	M	S									X					
1889	Ujina Shipbuilding Co.	Ujina Island	34 20-132 28	M	S										X				
1890	Toyo Industry	Hiroshima	34 22-132 30	S	P	X	X												
1891	Japan Steel Co.	Hiroshima	34 22-132 31	S	P		X												
1907	Kanokawa Oil Storage	Nishi Nomi Jima	34 11-132 26	P	P											X			

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JAPAN PROPER 90 TOKUYAMA 90.32

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
668	Kasado Dock Co.	Kasado Shima	33 57-131 51	M	M										X				
669	Hanano Waki Oil Storage	O Shima	33 59 131 47	M	S											X			
670	Japan Paraffin Mfg Co.	O Shima	33 59-131 47	M	M											X			
671	Hikari Naval Arsenal	Shimada	33 57-131 56	S	S		X												
672	Nippon Oil Co, Kudamatsu Plant	Kudamatsu	33 59-131 52	P	P											X			
☆ 673	Tokuyama Naval Fueling Station	Tokuyama	34 02-131 49	P	P											X			
674	Tokuyama Naval Coal Yard & Briquette Fty.	Tokuyama	34 02-131 49	M	S														Coal
675	Tokuyama Soda Co.	Tokuyama	34 03-131 48	S	S			X											
818	Ube Nitrogen Fertilizer Co.	Ube	33 57-131 14	S	P			X											
819	Nissan Chemical Industry Co. Onoda Plant	Onoda	33 59-131 11	S	S			X											
820	Japan Powder Mfg Co, Asa Plant	Asa	34 02-131 09	M	M		X												
821	Ube Cement Co.	Ube	33 57-131 14	M	M														Cement
822	Onoda Cement Co.	Onoda	33 58-131 10	M	S														Cement
825	Hitachi Mfg Co, Kasado Plant	Kudamatsu	33 59-131 53	P	P								X						Tanks Locos
827	Ube # 1 Steam Power Plant	Ube	33 57-131 15	M	M						X								
922	Riken Metal Co. Ube Plant	Ube	33 57-131 14	P	P											X			
1600	Onoda Steam Power Plant	Onoda	33 58-131 11	S	P						X								
1626	Ube # 2 Steam Power Plant	Ube	33 57-131 14	S	P						X								
1700	Hitachi Mfg Co.	Ube	33 57-131 14	M	M								X						
1841	Ube Coal Liquefaction Co.	Ube	33 57-131 14	P	P											X			
1844	Ube Soda Industry Co.	Ube	33 56-131 15	S	S		X												
1878	Ube Iron Work Co.	Ube	33 57-131 14	M	M								X						

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JAPAN PROPER 90 TOKUYAMA 90.32

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	Elec Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1879	Titanium Industry Co.	Ube	33 57-131 14	M	M			X											
1880	Nippon Motor Oil Co.	Ube	33 56-131 14	M	M												X		
1881	Tokuyama Sheet Iron Co.	O Shima	34 01-131 49	M	M								X						
1882	Toyo Soda Industry Co.	Tonda	34 03-131 46	S	S			X											
1883	Toyo Steel Plate Co.	Kudamatsu	34 00-131 52	M	M								X						
1884	O Shima Naval Oil Storage	O Shima	34 00-131 48	P	P												X		

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JAPAN PROPER 90 KYUSHU EAST 90.33

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	Elec Eqp/Radar	El Power	Harbor Fac/Wbs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1306	Saeki Naval Air Station	Saeki	32 57-131 55	S	P	X													
1310	Asahi Bemberg Gunpowder Plant	Nobeoka	32 35-131 40	P	P		X												
1311	Nippon Nitrogen Explosives Co. Kawashima Plant	Nobeoka	32 37-131 42	S	S		X												
1312	Nippon Nitrogen Explosives Co, Isunetomimura Plant	Nobeoka	32 33-131 41	M	M		X												
1313	Ohgi Fertilizer Co, Beppu	Oita	33 16-131 30	M	M			X											
1314	Asahi Bemberg Cuprammonium Plant, Nobeoka	Nobeoka	32 34-131 40	S	S			X											
1315	Asahi Bemberg Viscose Plant, Nobeoka	Nobeoka	32 34-131 40	S	S			X											
1316	Hodogoya Industrial Co. Hiji Plant	Hiji	33 22-131 32	S	S			X											
1317	Nippon Dye Works, Tsurusaki	Oita	33 14-131 42	S	S			X											
1318	Katakura Cereal Fertilizer Co, Oita	Oita	33 14-131 36	M	M			X											
1320	Gokasekawa Power Plant	Gokase River	32 39-131 22	M	P						X								
1327	Usuki Iron Works	Saganoseki	33 07-131 48	M	M								X						
1328	Saganoseki Copper Works	Saganoseki	33 15-131 53	S	S											X			
1329	Oita RR Yard	Oita	33 13-131 37	M	S													X	

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JAPAN PROPER 90 SHIMONOSEKI 90.34

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
☆ 28	Japan Iron Works, Yawata Plant	Yawata	33 52-130 48	P	P			X	X				X						
☆ 29	Japan Iron Works, Tobata Plant	Tobata	33 54-130 50	P	P				X				X						
32	Wakamatsu Port	Wakamatsu	33 53-130 49	P	P							X							
33	Tobata Port	Tobata	33 53-130 49	M	S							X							
39	Asano Portland Cement Co.	Moji	33 56-130 57	M	M								X						Cement
40	Asahi Oil Refinery	Hikoshima	33 56-130 56	M	M												X		
42	Shimonoseki Port	Shimonoseki	33 57-130 56	P	P							X							
43B	Osaka Iron Works	Hikoshima	33 56-130 56	M	M										X				
44A	Moji Central Wharf	Moji	33 57-130 58	P	P							X							
44B	Moji Southern Wharf	Moji	33 56-130 57	P	P							X							
44C	Moji Coaling Station	Moji	33 56-130 57	P	P							X							
46	Kobe Steel Works (Moji)	Moji	33 55-130 57	S	S											X			
49	Moji Ordnance Storage	Moji	33 57-130 58	P	P		X												
99	Shimonoseki- Maeda Power Plant	Shimonoseki	33 58-130 58	S	P					X									
165	Kokura Steel Works	Kokura	33 53-130 53	S	P								X						
☆ 168	Kokura Arsenal	Kokura	33 53-130 52	P	P		X												
177	Osaka Soda Co.	Kokura	33 53-130 53	M	M			X											
184	Kokura RR Shops	Kokura	33 53-130 52	S	P												X		
☆ 188	Kokura Steam Power Plant # 2	Kokura	35 53-130 52	S	P					X									
555	Tokai Steel Mfg Co.	Wakamatsu	33 54-130 49	M	M								X						
558	Tochigi Co.	Wakamatsu	33 55-130 49	M	M									X					
561	Wakamatsu RR Shops	Wakamatsu	33 54-130 49	M	S												X		

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JAPAN PROPER SHIMONOSEKI 90.34

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Muns	Chemicals	Coke	Elec Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Wpy Trans	OTHER
567	Asahi Glass Co.	Tobata	33 53-130 49	M	M			X											
569	Kyushu Chemical Industry	Yawata	33 53-130 49	M	M			X											
772	Kammon RR Tunnel Viaduct	Hikoshima	33 56-130 55	S	P												X		
☆1108	Nippon Aluminum Co.	Kurosaki	33 52-130 45	P	P											X			
1110	Moji RR Station & Yards	Moji	33 56-130 58	M	S												X		
1111	Shimonoseki RR Yards	Shimonoseki	33 57-130 57	S	S							X					X		
☆2113	Nippon Synthetic Industry (Kurosaki)	Kurosaki	33 52-130 46	P	P			X	X							X			
1115	Kyushu Soda Co.	Kanoa	33 47-130 59	M	M			X											
1119	Hatabu RR Shops & Yards	Hatabu	33 58-130 56	S	P												X		
1123	Nissan Liquid Fuel Co.	Wakamatsu	33 53-130 45	M	M											X			
1126	Yasukawa Electric Mfg Co.	Yawata	33 52-130 46	S	S								X						
☆1127	Kokura Steam Power Plant # 1	Kokura	33 53-130 52	S	P						X								
1128	Kokura Steam Power Plant # 3	Kokura	33 53-130 52	S	P						X								
☆1294	Tobata Steam Power Plant	Tobata	33 54-130 50	S	P						X								
1845	Kobe Steel Works (Chofu)	Chofu	34 00-131 00	S	S										X				
1846	Mitsubishi Shipyard	Hikoshima	33 56-130 56	M	M									X					
1847	Mitsui Zinc Smelter	Hikoshima	33 56-130 54	P	P										X				
1848	Nitto Sodium Sulphate Co.	Hikoshima	33 55-130 55	M	M		X												
1849	Oriental High Pressure Industry	Hikoshima	33 56-130 54	M	M		X												
1850	Furukawa Electric Co.	Moji	33 55-130 57	S	S					X									
1851	Nippon Synthetic Industry (Yawata)	Yawata	33 53-130 49	M	M		X	X											
1852	Hitachi Machine Works, Tobata Plant	Tobata	33 53-130 49	S	S								X						

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JAPAN PROPER 90 SHIMONOSEKI 90.34

TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Ams	Chemicals	Coke	El Equ/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Veh Tls	Nav E/Ship Yds	Non f Metals	Petroleum	Wky Trans	OTHER
1853	Oriental Can Mfg Co.	Tobata	33 54-130 49	M	M		X												
1855	Nippon Electric Metallurgical Co.	Moji	33 55-130 57	S	S								X			X			
1856	Kyushu Special Steel Co.	Kokura	33 53-130 52	M	M								X	X					
1857	Okuma Iron Works	Kiku Machi	33 52-130 53	S	S		X							X					
1859	Tokyo Rope Mfg. Co.	Kokura	33 53-130 54	S	S								X						
1860	Oriental Special Castings Co.	Kokura	33 53-130 53	M	M								X						
1861	Hitachi Machine Works, Wakamatsu Plant	Wakamatsu	33 55-130 49	S	S									X					
1863	Nippon Explosives Mfg Co.	Orio-Asakawa	33 53-130 42	M	M		X	X											
1864	Tokai Electpodes Mfg Co.	Wakamatsu	33 53-130 47	M	M					X									
1865	Hokoku Cement Co.	Kanoa	33 47-130 59	M	M								X						Cement
1866	Kokura Harbor Installations	Kokura	33 53-130 53	M	S							X							
1867	Kanda Port	Kanda	33 47-130 59	M	S							X							
1869	Chofu Port	Chofu	34 00-131 00	M	S							X							

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N	CO-ORDS E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Nhs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
662	Watanabe Aircraft Plant	Zasshonoguma	33-32-	130 27	S	P	X													
663	Fukuoka Air Station	Fukuoka	33 41-	130 24	S	P														Navy AB
664	Najima Steam Power Station	Fukuoka	33 39-	130 25	S	P						X								
665	Saitozaki Petroleum Storage	Fukuoka	33 39-	130 22	S	P												X		
838	Isahaya RR Junctions	Isahaya	32 51-	130 03	S	S													X	
1236	Tachiarai Army Airfield	Tachiarai	33 24-	130 38	S	P														Depot
1237	Najima Seaplane Base	Fukuoka	33 39-	130 26	S	S														Navy AB
1238	Watanabe Iron Works, Plant No. 1	Fukuoka	33 36-	130 25	S	S		X							X					
1239	Kyusnu Ordnance Plant	Zasshonoguma	33 33-	130 28	S	S	X	X							X					
1241	Miyata Motor Works	Zasshonoguma	33 31-	130 29	M	M	X													
1242	Sangyo Cement Co.	Nogata	33 38-	130 46	M	M														Cement
1243	Miike Dyestuffs	Omuta	33 02-	130 27	P	P			X	X										
1244	Oriental High Pressure Co, Plant A	Omuta	33 01-	130 28	P	P			X											
1245	Oriental High Pressure Co. Plant B	Omuta	33 02-	130 26	S	S			X											
1246	Electro-Chemical Industry	Omuta	33 02-	130 26	M	M			X											
1247	Kurume Military Zone	Kurume	33 18-	130 32	M	M		X												
1249	Omuta No. 1 Steam Power Plant	Omuta	33 00-	130 26	S	P						X								
1250	Onagohata Power Station	Hida	33 17-	130 59	M	M						X								
1254	Miike Harbor	Omuta	33 00-	130 25	P	P							X							
1255	Hakata Harbor	Fukuoka	33 36-	130 24	M	S							X							
1256	Miike Machinery Works	Omuta	33 02-	130 27	S	S									X					
1257	Kobukro Machinery Works	Nogata	33 39-	130 41	M	M									X					

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JAPAN PROPER 90 KURUME 90.35

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Guns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Shs	Iron/Steel	Mech/Veh Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Ry Trans	OTHER
1259	Togami Electric Works	Saga	33 16-130 10	M	M					X									
1260	Mitsui Zinc Distillery	Omuta	33 02-130 27	P	P			X								X			
1261	Mitsui Electrolytic Zinc Refinery	Omuta	33 02-130 26	P	P			X								X			
★1262	Mitsui Coal Liquefaction Plant	Omuta	33 02-130 27	P	P												X		
1263	Bridgestone Tire Co.	Kurume	33 19-130 30	P	P														Rubber
1264	Nippon Rubber Co.	Kurume	33 19-130 30	M	M														Rubber
1265	Nippon Rubber Co. Fukuoka Plant	Fukuoka	33 35-130 25	S	S			X											Rubber
1266	Tsuchiya Tabi Co - Rubber Shoe Industry	Kurume	33 18-130 30	S	S														Rubber
1268	Mitsui RR Workshops	Omuta	33 00-130 25	M	S													X	
1269	Kurume RR Station	Kurume	33 19-130 30	M	M													X	
1270	Hakata RR Yards & Station	Fukuoka	33 36-130 25	M	S													X	
1274	Dainoura Mine	Nogata	33 43-130 40	M	M														Coal
1275	Tagawa Mines	Nogata	33 38-130 49	M	M														Coal
1276	Futase Mines	Nogata	33 39-130 40	M	M														Coal
1277	Kineshima Mine	Saga	33 14-130 05	M	M														Coal
1278	Manda Mine	Omuta	33 00-130 27	M	M														Coal
1279	Yotsuyama Mine	Omuta	33 00-130 25	M	M														Coal
1595	Omuta No. 2 Steam Power Plant	Omuta	33 00-130 25	S	P						X								
1596	Omuta No. 3 Steam Power Plant	Omuta	33 00-130 25	S	P						X								
1870	Tachiarai Machine Works	Tachiarai	33 24-130 37	S	S	X													
1871	Tosu RR Yards & Repair Shops	Tosu	33 23-130 31	S	P												X		
1872	Showa Iron Works	Fukuoka	33 38-130 25	S	S		X					X							

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TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1873	Tatara Machinery Works	Fukuoka	33 36-130 27	M	M									X					
1874	Asano Cement Co.	Nogata	33 40-130 51	M	M							X							Cement
1875	Japan Explosives Mfg Co.	Nogata	33 37-130 40	M	M		X												
1877	Toyo Aluminum Co.	Miike	33 03-130 28	P	P											X			

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JAPAN PROPER 90 SASEBO 90.36

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Guns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
542	Akuncura Engine Works	Nagasaki	32 44-129 52	P	P										X				
543	Mitsubishi Dockyard	Nagasaki	32 44-129 51	S	P										X				
544	Tategami Shipyard	Nagasaki	32 44-129 51	P	P										X				
545	Kozaki Point Oil Storages	Nagasaki	32 43-129 51	S	P												X		
546	Mitsubishi Steel & arms Works	Nagasaki	32 45-129 52	S	P		X												
*752	Sasebo Naval Dockyard	Sasebo	33 10-129 42	P	P										X				
754	Sasebo Naval Air Station	Sasebo	33 08-129 43	S	S	X													
755	Sasebo Oil Storages	Sasebo	33 07-129 42	S	P													X	
757	Sasebo Mine & Torpedo Storage	Sasebo	33 09-129 43	M	S		X												
758	Naval Arsenal & Engineering Department	Sasebo	33 10-129 42	P	P		X												
762	Sasebo Fuel & Munitions Depot	Sasebo	33 09-129 43	S	S		X												
828	Hayashi Commercial Co. Engine Works	Nagasaki	32 45-129 52	S	S										X				
829	Mitsubishi Electric Mfg. Co.	Nagasaki	32 45-129 52	P	P					X									
832	Megami Point Oil Storages	Nagasaki	32 43-129 51	M	S												X		
833	Karatsu Iron Works	Karatsu	33 28-129 57	F	P									X					
834	Sasebo Aircraft Factory	Sasebo	33 09-129 43	M	S	X													
838	Isahaya RR Junctions	Isahaya	32 51-130 03	S	P													X	
839	Haiki RR Terminal	Haiki	33 00-129 48	M	S													X	
842	Taka Shima Colliery	Takashima Isl.	32 39-129 46	M	S														Coal
843	Ha Shima Colliery	Hashima Isl.	32 37-129 44	M	S														Coal
845	Sasebo Provision Wharf	Sasebo	33 10-129 43	M	S						X								
849	Omura Naval Air Station	Omura	32 56-129 56	S	P	X													

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JAPAN PROPER 90 SASEBO 90.36

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
360	Kawanami Industry Co. Shipyard	Koyagishima Isl.	32 42-129 49	S	P										X				
1603	Aincura Steam Power Station	Aincura	33 12-129 39	M	S						X								
1627	Omura Aircraft Factory	Omura	32 55-129 56	P	P	X													
1759	Mitsubishi Steel Rolling Mill	Nagasaki	32 46-129 51	S	S								X						
1835	Yokose Oil Storage	Yokose	33 05-129 42	S	P												X		
1842	Nagasaki & Dejima Wharves & RR Yards	Nagasaki	32 45-129 52	S	S							X							
1843	Kyushu Coal & SS Co. Colliery	Sakitoshima Isl.	33 00-129 33	M	S														Coal

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JAPAN PROPER 90 YATSUSHIRO 90.37 KYUSHU SOUTH 90.38

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1378	Kanoya Naval Air Station	Nori	31 23-130 52	S	P														Navy AB
1379	Miyakonojo Army A/D	Miyakonojo	31 44-131 03	S	S														Trng & Repts
1380	Kagoshima Army Post	Kagoshima	31 37-130 33	M	M		X												
1382	Sakura Island Oil Storage	Kagoshima	31 36-130 37	M	M												X		
1386	Japan Nitrogen Fertilizer Co.	Minimata	32 12-130 24	P	P			X											
1387	Nissan Chemical Co.	Kagami	32 33-130 38	S	S		X	X											
1388	Umoto Power Plant	Minimata	32 12-130 23	S	S						X								
1517	Kagoshima RR Repair Shops	Kagoshima	31-34-130 32	M	S													X	
1518	Kagoshima Station & Freight Yards	Kagoshima	31 36-130 34	M	S													X	
1538	Kyushu Soda Co.	Amakusa 1.	32 27-130 25	M	M			X											
1539	Tokai Electrode Co.	Tanoura	32 19-130 29	M	M			X		X									
1540	Nitrogen Plant	Kushikino	31 42-130 17	S	S			X											

YATSUSHIRO 90.37, KYUSHU SOUTH 90.38

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KOREA SEISHIN 84.1

TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Ams	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Shs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Ry Trans	OTHER
13	Seishin Harbor	Seishin	41 47-129 50	S	P							X							
14	Rashin Harbor	Rashin	42 13-130 18	S	P							X				X			
15	Yuki Harbor	Yuki	42 20-130 24	M	S							X						X	
16	Seishin RR Yards	Seishin	41 47-129 49	M	S													X	
17	Seishin Railway Workshops	Seishin	41 47-129 48	M	S													X	
18	Rashin RR Yards	Rashin	42 15-130 18	M	S													X	
19	Tumen River Bridge No. 1	Nanyo	42 59-129 48	S	S													X	
20	Tumen River Bridge No. 2	Kamisanpo	42 42-129 45	S	S													X	
☆ 28	Japan Iron Works	Seishin	41 45-129 46	P	P								X						
☆ 29	Mitsubishi Iron Co.	Seishin	41 46-129 47	P	P								X						
31	Japan High Frequency Heavy Industry Co.	Joshin	40 41-129 12	M	M								X						
32	Mozan Iron Mine	Mozan	42 14-129 16	S	P								X						
☆125	Agochi Coal Liquefaction Plant	Agochi	42 33-130 21	P	P														
126	Korean Coal Industry Co.	Dian	41 15-129 30	S	S											X			
127	Shako Ore Loader	Shako	40 12-128 39	M	S											X			
132	Joshin Harbor	Joshin	40 40-129 12	M	S						X								

KOREA SEISHIN 84.1

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KOREA KONAN 84.2

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
☆ 1	Chosen Nitrogen Fertilizer Co	Konan	39 50-127 38	P	P			X					X			X			
2	Chosen Nitrogen Explosives Factory	Konan	39 49-127 35	S	P			X											
3	Motomiya Fertilizer Factory	Konan	39 51-127 35	S	S			X											
4	Choshin Hydro Plant No.1.	Chinkori	40 13-127 18	S	P					X									
5	Choshin Hydro Plant No. 2	Tokori	40 10-127 19	S	S					X									
8	Fusen Hydro Plant No. 1	Shoko	40 21-127 34	S	P					X									
212	Kyosen Hydro Electric Plant No. 1	Nanti River	40 35-128 30	S	P					X									

KOREA KONAN 84.2

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KOREA HEIJO 84.3

TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Wy Trans	OTHER
59	Chosen Chemical Industry	Junsen	39 25-125 57	M	S		X	X											
60	Japan Explosives Co.	Kaishu	38 02-125 41	M	S		X	X											
61	Heijo Army Arsenal	Heijo	39 00-125 44	S	P		X					X							
65	Showa Aircraft Factory	Mirin Ri	39 01-125 51	M	S	X													
☆ 66	Japan Iron Co.	Konjiho	38 44-125 37	S	P								X						
67	Chosen Riken Metals Co.	Chinnampo	38 43-125 23	P	P											X			
68	Japan Mining Co. Smelter	Chinnampo	38 44-125 26	M	S			X								X			
73	Heijo RR Station	Heijo	39 00-125 44	M	M							X						X	
74	Heijo Shunting Yards	Heijo	39 03-125 44	M	S													X	
76	Chinnampo Harbor	Chinnampo	38 43-125 24	M	S							X			X				
77	Chinnampo Naval Fuel Depot	Chinnampo	38 43-125 25	M	M							X					X		
82	Onoda Cement Co.	Shokori	38 59-125 59	M	S								X						Cement
91	Daido River RR Bridges	Heijo	38 59-125 45	M	S													X	
102	Chosen Cement Co	Kaishu	39 00-125 42	M	P								X						Cement
110	Asano Cement Co.	Dunsei	38 27-125 49	M	S														Cement
211	Seisen River RR Bridges	Shinanshu	39 37-125 32	M	S													X	

HEIJO 84.3

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KOREA GENZAN 84.4

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
88	Chosen Oil Refinery	Genzan	39 09-127 28	S	P												X		
89	Genzan Harbor	Genzan	39 10-127 26	M	S							X							
90	Rising Sun Petroleum Co.	Bumyo	39 14-127 22	M	M												X		

KOREA GENZAN 84.4

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KOREA EAST 84.5

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
112	Kanko Hydro Power Co.	Kasen	38 06-127 42	S	P						X								
113	Neietsu Steam Power Plant	Neietsu	37 11-128 00	S	P						X								

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KOREA EAST 84.5

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KOREA KEIJO 84.6

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N	CO-ORDS E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
42	Han River RR Bridges	Keijo	37 31	126 57	M	S													X	
43	Ryuzan RR Shops & Yards	Keijo	37 32	126 58	S	P													X	
45	Jinsen Harbor	Jinsen	37 28	126 37	S	P							X							
116	Korea Refining Co.	Choko	36 01	126 42	S	S											X			
122	Kason Hydro Electric Plant	Kitakan River	38 06	127 42	S	S						X								
123	Seihei Hydro Electric Plant	Kitakan River	37 43	127 25	S	S						X								
124	Freight Yards	Suisho-ku	37 35	126 54	S	P													X	
210	Ryuzan Mfg Co.	Keijo	37 32	126 59	M	S									X					Roll Stock

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KOREA FUSAN 84.7

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
97	Fusan Harbor	Fusan	35 07-129 03	P	P							X			X			X	
101	Chinkai Naval Base	Chinkai	35 09-128 38	M	S										X				
105	Fusan RR Workshops	Fusan	37 07-129 02	M	S													X	
106	Rakuto River RR Bridge	Waikin	36 00-128 23	M	S							X							

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KOREA KOSHU 84.8

TARGET NO	TARGET NAME	GENERAL LOCATION	CO-ORDS N	CO-ORDS E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	Elec Eqp/Radar	Elec Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
98	Reisui Harbor	Reisui	34 44	127 44	M	S							X							
99	Moppo Harbor	Moppo	34 47	126 23	M	S							X							
100	Gunzan Harbor	Gunzan	35 59	126 43	M	S							X							
131	Japan Diesel Co.	Gunzan	35 59	126 44	M	M	X								X					

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C O N F I D E N T I A L

MANCHURIA 93.1 thru 93.5

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N	CO-ORDS E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Ry Trans	OTHER
1	Manchuria Petroleum Co.	Kanseishi	38	58-121 39	S	P												X		
6	Naval Oil Storage	Port Arthur	38	48-121 16	M	M												X		
8	Kanseishi Steam Power Plant	Kanseishi	38	58-121 37	S	S					X									
10	Manchuria Dockyard Co.	Dairen	38	56-121 39	M	S										X				
11	Naval Dockyard	Port Arthur	38	48-121 16	S	P										X				
13	Dairen Piers	Dairen	38	56-121 39	S	P							X						X	
15	Kanseishi Coal Pier	Kanseishi	38	58-121 38	M	S							X							Coal
16	SMR Workshops	Dairen	38	56-121 35	S	P													X	
17	Dairen Machinery Co.	Dairen	38	54-121 34	M	M									X					
19	Manchurian Chemical Industry	Kanseishi	38	58-121 37	M	S		X												
20	Manchuria Soda Co.	Kanseishi	38	58-121 37	M	S		X												
27	Amanagawa Steam Power Plant	Dairen	38	55-121 35	M	M					X									
☆ 29	Showa Steel Works	Anshan	41	05-122 56	P	P								X						
☆ 30	Penhsihu Iron Works	Penhsihu	41	20-123 46	P	P								X						
32	Manchuria Light Metals Co.	Fushun	41	50-123 47	S	P											X			
34	Manchuria Magnesium Industry Co.	Yingkou	40	40-122 20	S	P											X			
35	Taikanton Steam Power Plants	Fushun	41	51-133 52	P	P					X									
39	Fuhsin Steam Power Plant	Fushin	42	06-121 28	M	S					X									
☆ 40	SMR Shale Oil Plant	Fushun	41	51-123 51	P	P												X		
☆ 41	SMR Coal Liquefaction Plant	Fushun	41	50-123 48	S	P												X		
43	Manchuria Coal Liquefaction Co.	Sunpin-kai	43	12-124 22	S	S												X		
45	Manchuria Airplane Mfr Co. & Fuselage Assembly	Mukden	41	51-123 26	S	S	X													

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MANCHURIA 93.1 thru 93.5

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MANCHURIA 93.1 thru 93.5

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
☆ 48	Mukden Arsenal	Mukden	41 48-123 29	S	P		X												
50	Sumitomo Metal Works	Mukden	41 48-123 22	M	M									X					
52	Manchuria Electric Wire Co.	Mukden	41 48-123 22	M	M					X									
53	Mukden RR Yards	Mukden	41 47-123 23	S	P													X	
54	Onoda Cement Works	Pucyaitun	38 58-121 31	M	S														Cement
55	Kirin Hydro Plant	Fegmon	43 42-126 41	S	P						X								
56	Suiho Hydro-Electric Plant	Suiho	40 27-125 55	S	P						X								
57	Tunghua Steel Works	Ertaokou	41 44-126 01	M	S								X						
☆ 58	Kirin artificial Oil Co.	Lungtanshan	43 50-126 35	S	P											X			
62	SVR Sulphuric Acid Plant	Fushun	41 50-123 51	M	M			X											
69	Fushun RR Yards & Repair Shops	Fushun	41 51-123 51	S	S													X	
72	Antung RR Yards	Antung	40 07-124 22	M	S													X	
77	Yalu River RR Bridges	antung	40 07-124 23	M	S													X	
85	Tashito Harbor Facilities	Tashito	39 50-124 25	M	M							X							
91	Harbin RR Yards & Warehouses	Harbin	45 25-126 40	M	S							X						X	
92	Harbin RR Bridge No. 1	Harbin	45 48-126 37	M	M													X	
113	Harbin RR Bridge No. 2	Harbin	45 48-126 40	M	M													X	
114	Harbin RR Repair Shops	Harbin	45 47-126 37	M	S													X	
155	Tsitsihar RR Repair Shops & Yards	Tsitsihar	47 23-123 57	M	S													X	
164	Manchuria Machine Tool Co.	Mukden	41 48-123 28	M	S									X					
165	Mukden Engineering Works	Mukden	41 49-123 22	M	M									X					
166	Manchuria Iron Works	Mukden	41 48-123 28	M	S	X													

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MANCHURIA 93 .1 thru 93.5

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Muns	Chemicals	Coke	Elec Eqp/Radar	Elec Power	Harbor Fac/Nav	Iron/Steel	Mach/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rail Trans	OTHER
168	Oriental Steel Products Co.	Mukden	41 48-123 22	M	M									X					
169	Hun River Steam Power Plant	Mukden	41 46-123 24	M	M						X								
170	Dairen Machinery Mfg Co.	Mukden	41 48-123 22	M	M									X					
171	Penhsihu Iron Works New Plant	Miyanohara	41 18-123 46	M	S								X						
172	Hulutao Port Facilities	Hulutao	40 44-121 01	M	M							X							
173	Suchiatun RR Junction & Repair Shops	Suchiatun	41 40-123 21	S	P													X	
174	Yinkou Harbor Facilities	Yinkou	40 41-122 12	M	M							X							
175	Manchuria Synthetic Fuel Co.	Chinchow	41 07-121 06	M	S											X			
177	Manchuria Airplane Mfg Co. Engine Plant	Mukden	41 48-123 30	M	S	X													
178	Huangkutun RR Repair Shops	Mukden	41 49-123 23	M	S													X	
179	Kyowa Industrial Co.	Mukden	41 49-123 22	M	M									X					
180	Manchuria Rolling Stock Co.	Dairen	38 55-121 25	M	M													X	
181	Oriental Tire Industry	Mukden	41 47-123 21	M	M														Rubber
182	Manchuria Hitachi Engineering Works	Mukden	41 49-123 22	M	M									X					
184	SMR Central Laboratory	Dairen	38 55-121 37	M	M			X											
185	Manchuria Castings Co.	Mukden	41 47-123 25	M	M									X					
187	Hulutao Lead & Zinc Smelter	Hulutao	40 44-120 56	M	S											X			
188	Tatung Harbor Facilities	Tatung	39 54-124 11	M	M						X								
196	Yamato Dye Co	Dairen	38 55-121 40	M	M			X											
197	Jijoko Oil Storage Area	Dairen	38 55-121 41	M	M											X			
362	Ssupingkai RR Yards & Repair Shops	Ssupingkai	43 11-124 21	M	M												X		
363	Hsinking RR Yards	Hsinking	43 54-125 19	M	M												X		

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MANCHURIA 93.1 thru 93.5

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Ammo	Chemicals	Coke	Elec Eqp/Radar	Elec Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rly Trans	OTHER
364	Kirin RR Yards & Repair Shop	Kirin	43 51-126 33	M	M													X	
365	Suifenho RR Repair Shops & Yards	Suifenho	44 24-131 09	M	M													X	
366	Mutanchiang RR Yards	Mutanchiang	44 35-129 37	M	M													X	
367	Hun River RR Bridge	Mukden	41 45-123 23	M	M													X	
368	Taishu River RR Bridges	Liaoyang	41 18-123-12	M	M													X	

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MANCHURIA 93.1 thru 93.5

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CHINA

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CHINA 83 SHANGHAI 83.1 WENCHOW 83.2 HANKOW 83.8

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
99	Pukow RR Ferry Pier	Pukow	32 05-118 44	S	P													X	
100	Shanghai - Naking RR Workshops	Shanghai	31 22-121 30	S	P													X	
107	Shanghai Portland Cement Co.	Shanghai	31 09-121 26	M	S														Cement
108	Shanghai Power Co. Riverside Plant	Shanghai	31 16-121 33	S	P						X								
109	Chapei Electric Company	Shanghai	31 21-121 31	M	S						X								
110	French Electric Company	Shanghai	31 12-121 28	M	M						X								
111	Woosung Storage	Woosung	31 23-121 30	S	P							X							
112	Jukong Wharf	Shanghai	31 19-121 33	S	S							X							
113	Point Island-Storage	Shanghai	31 17-121 33	S	S							X							
114	Shen-chia-yuan Port	Shen-chia-yuan	30 15-115 02	M	S							X							
115	Shih-hwei-yao Port	Shih-hwei-yao	30 12-115 03	S	P							X							
116	Wuhu Harbor	Wuhu	31 20-118 22	S	P							X							
117	Kiangnan Dock & Engineering Works	Shanghai	31 12-121 29	S	S									X					
118	Yangtzepoo Docks Nos. 1 & 2	Shanghai	31 15-121 31	M	S									X					
119	International Dock	Shanghai	31 16-121 33	M	S									X					
121	Tungkadoo Dock	Shanghai	31 13-121 30	M	M									X					
122	Kiousin Dock	Shanghai	31 13-121 30	M	S									X					
123	Ping An Dock	Shanghai	31 12-121 30	M	M									X					
124	Petroleum Center	Shanghai	31 21-121 32	M	S											X			
125	Maruzen Oil Installation	Shanghai	31 20-121 33	M	M											X			
126	Standard-Vacuum Oil Storage	Shanghai	31 16-121 33	M	S											X			
127	Shanghai-Nanking RR, North Station	Shanghai	31 15-121 28	M	S													X	

SHA JAI 83.1 WENCHOW 83.2 HANKOW 83.8

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CHINA 83 SHANGHAI 83.1 WENCHOW 83.2 HANKOW 83.8

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	Elec Eqp/Radar	Elec Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
128	Shanghai South Railroad Yards	Shanghai	31 12-121 29	M	M													X	
129	Nanking RR Ferry Pier	Nanking	32 05-118 45	S	P													X	
130	Japanese Naval Headquarters	Shanghai	31 16-121 29	M	M														Admin.
131	South Shanghai Railroad Wharves	Shanghai	31 11-121 28	M	M													X	
132	Chientang River Bridge	Hangchow	30 12-120 10	M	S													X	
133	Markham Road Yard	Shanghai	31 15-121 27	M	M													X	
134	Administrative Headquarters	Shanghai	31 14-121 29	M	M														admin.
135	Army Branch Headquarters	Shanghai	31 14-121 29	M	M														admin.
136	Japanese Consulate	Shanghai	31 15-121 29	M	M														admin.
137	Naval Branch Headquarters	Shanghai	31 16-121 29	M	M														admin.
138	Gendarmerie Headquarters	Shanghai	31 16-121 32	M	M														Admin.
142	Shih-hwei-yao RR Workshops	Shih-hwei-yao	30 12-115 03	M	M													X	
154	Moller Steamship Co.	Shanghai	31 18-121 34	M	M									X					

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CHINA 83 CANTON 83.4

TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	Elec Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mech/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Ry Trans	OTHER
48	Hong Kong Electric Co, North Point	Hong Kong	22 18-114 11	M	P						X								
49	China Light & Power Co.	Kowloon	22 19-114 11	M	P						X								
50	Kowloon Wharves	Kowloon	22 18-114 10	S	P							X							
51	Whampoa Wharves	Canton	23 06-113-26	M	S							X							
52	Typhoon Refuge Harbor	Kowloon	22 19-114 10	M	M							X							
53	Taikoo Dockyard	Hong Kong	22 17-114 13	S	P										X				
54	Royal Navy Yard	Hong Kong	22 17-114 10	S	S										X				
55	Kowloon Dockyard	Kowloon	22 18-114 10	S	P										X				
56	Cosmopolitan Dock	Hong Kong	22 19-114 10	S	P										X				
57	Aberdeen Dock	Hong Kong	22 17-114 09	M	M										X				
58	Standard Oil Storage	Kowloon	22 20-114 08	M	S												X		
59	Kowloon RR Terminal	Kowloon	22 17-114 10	M	S													X	
60	Canton-Kowloon Railroad Workshops	Kowloon	22 19-114 11	M	P													X	
61	Green Island Cement Co	Kowloon	22 19-114 11	M	S														Cement
95	Texas Oil Storage	Chen Wan Bay	22 22-114 07	M	S												X		
96	Lin Ma Hang Lead Mine	Lin Ma Hang	22 33-114 10	M	S											X			
97	Army Depot	Canton	23 08-113 19	M	S	X													

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CHINA 83 HAINAN ISLAND 83.6

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
30	Kiungshan Air Base	Hoihow	20 01-110 20	M	S														Air Base
31	Sam-A Air Base	Sam-A	18 13-109 28	M	S														Air Base
48	Yulinkan Harbor (SE Shore)	Yulinkan	18 14-109 35	M	M							X							
143	Fatlaw Air Base	Wong Lau	18 23-108 52	M	S														Air Base
144	Sam-A Naval Supply Depot	Sam-A	18 17-109 29	S	P		X												
145	Sam Kong Munitions Dump	Sam-A	18 15-109 31	M	S		X												
146	Yulinkan Harbor (West Shore)	Yulinkan	18 14-109 33	P	P							X							
147	Yulinkan Harbor (SE Shore) Oil Storage	Yulinkan	18 14-109 35	P	P											X			
149	New Hoihow Seaport	Hoihow	20 02-110 16	S	S							X							
151	Sam-A Ammunition Depot	Sam-A	18 21-109 27	M	S		X												
152	Army Headquarters	Hoihow	20 03-110 20	M	S														Admin.
153	Custom House	Hoihow	20 03-110 20	M	S														Admin.

Hainan Island 83.6

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CHINA 83 TSINGTAO 83.11

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	Elec Eqp/Radar	El Power	Harbor Fac/Wks	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Sky Trans	OTHER
63	Tzuchwan Mines - Coal	Tzuchwan	36 39-117 57	S	S														Coal
64	Fangtze Mines - Coal	Fangtze	36 37-119 08	S	S														Coal
65	Tsaochwang Mines - Coal	Tsaochwang	34 52-117 26	S	P														Coal
68	New Power Plant (Tsingtao)	Tsingtao	36 07-120 20	M	S						X								
69	Old River Plant (Tsingtao)	Tsingtao	36 04-120 18	M	S						X								
70	Power Plant (Lao-Yao)	Lao-Yao	34 44-119 27	M	S						X								
73	Jap Gen-darme Hqs.	Tsingtao	36 04-120 19	M	S														Admin.
74	Jap Naval Hqs.	Tsingtao	36 04-120 19	M	S														Admin.
75	Asia Affairs Board	Tsingtao	36 04-120 19	M	S														Admin.
76	Oil Storage area	Tsingtao	36 05-120 20	M	S											X			
78	Harbor Facilities & Shipping (Tsingtao)	Tsingtao	36 05-120 19	S	P						X								
79	Harbor Facilities & Shipping (Lao-Yao)	Lao-Yao	34 44-119 27	S	S						X								
88	RR Shops & Roundhouse (Tsingtao)	Tsingtao	36 06-120 20	S	P													X	
89	RR Shops (Tsinan)	Tsinan	36 40-117 01	S	P													X	
91	Yellow River RR Bridge	Tsinan	36 43-117 01	M	S													X	
93	Drydock	Tsingtao	36 04-120 18	M	S						X								
94	Naval Repair Shops	Tsingtao	36 05-120 19	M	M										X				
139	Poshan Mines - Coal	Poshan	36 31-117 51	S	P														Coal

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TSINGTAO 83.11

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CHINA 83 TIENTSIN 83.12

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	Elt Eqp/Radar	Elt Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Wwy Trans	OTHER
1	New Japanese Coal & Ore Wharf	Tangku	39 01-117 39	P	P							X							
2	Taku Tug & Lighterage Co.	Taku	39 00-117 42	S	P										X				
3	Butterfield & Swire Co. Wharves	Taku	39 00-117 41	P	P							X							
4	Asiatic Petroleum Co.	Taku	38 59-117 40	S	P												X		
5	Japanese Oil Storage	Taku	38 59-117 40	S	P												X		
6	Chinese Naval Dockyard	Taku	38 59-117 40	S	P										X				
7	General Wharf Area	Tangku	39 00-117 40	P	P							X							
8	Yung Li alkali Plant	Tangku	39 01-117 40	S	P		X												
9	Standard Vacuum, Ta Hwa, Idemitsu Cos	Tanku	39 02-117 38	P	P												X		
10	Asiatic Petroleum Co.	Tientsin	39 08-117 12	P	P												X		
11	East Station	Tientsin	39 08-117 11	M	S													X	
12	Central Station & Yards	Tientsin	39 10-117 11	M	S													X	
13	Standard Vacuum Oil Co.	Tientsin	39 07-117 13	P	P												X		
14	Jardine Matheson Wharves	Tientsin	39 07-117 12	S	P							X							
15	Belgian Tramway & Light Co	Tientsin	39 08-117 11	M	S					X									
16	British Electric Co.	Tientsin	39 07-117 11	M	S					X									
17	Hsin Kai River RR Bridge	Tientsin	39 10-117 11	M	S													X	
18	Hai River RR Bridge	Tientsin	39 09-117 10	M	S													X	
19	West Station Yards	Tientsin	39 09-117 09	M	S													X	
20	Hai Ho Conservancy Board Dockyard	Tientsin	39 06-117 13	M	S									X					
21	Texas Co.	Tientsin	39 08-117 11	S	S											X			
22	Anchorage	Taku Bar	38 50-117 50	P	P							X							

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CHINA-33 TIENTSIN 33.12

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	Elec Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
24	Piers	Chinwangtao	39 55-119 37	P	P							X							
25	Kailan Mining Administration RR Yds & Shops	Chinwangtao	39 56-119 37	S	P													X	
26	Port Power House	Chinwangtao	39 56-119 37	S	S						X								
27	Yao Hua Glass Works	Chinwangtao	39 56-119 36	M	M														Glass
28	Peiping-Mukden MR Station & Yards	Chinwangtao	39 56-119 36	M	S													X	
29	Tientsin Lighter Co.	Taku	39 00-117 41	M	S										X				
34	Linsi Power House	Linsi	39 42-118 26	P	P						X								
35	Tangsham Power House	Tangsham	39 38-118 14	P	P						X								
36	Tangsham RR Shops	Tangsham	39 40-118 12	P	P													X	
37	New Cement Works	Tangsham	39 40-118 12	M	M														Cement
38	Lwan River RR Bridge	Lwannsien	39 46-118 47	S	P													X	
39	Pehtang River RR Bridge	Pai Ho	39 17-117 45	S	P													X	
40	RR Shops	Shanhaikwan	40 01-119 45	S	P													X	
44	RR Shops	Tientsin	39 10-117 11	P	P													X	

TIENTSIN 33.12

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INDO-CHINA 85 NORTH 85.1

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Equ/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
4	Tourane Airport	Tourane	16 03-108 12	M	P														Air Base
5	Gialam Airport	Hanoi	21 02-105 53	M	P														Air Base
6	Bach Mai Airport	Hanoi	21 01-105 50	M	P														Air Base
9	Haiphong Airport	Haiphong	20 50-106 43	M	P														Air Base
14	Haiphong Drydock	Haiphong	20 52-106 41	M	M							X							
15	Tong Airport	Sontay	21 07-105 27	M	S														Air Base
16	Haiphong Cement Plant	Haiphong	20 52-106 40	M	P														Cement
18	Haiphong Phosphate Plant	Haiphong	20 52-106 40	M	P			X											
19	Hanoi Alcohol Distillery	Hanoi	21 01-105 52	M	S			X											
20	Hai Duong Alcohol Distillery	Hai Duong	20 57-106 20	M	S			X											
21	Namdinh Alcohol Distillery	Nam Dinh	20 25-106 10	M	S			X											
22	Thanh Hoa Alcohol Distillery	Thanh Hoa	19 50-105 46	M	S			X											
23	Hanoi Power Plant	Hanoi	21 02-105 51	M	S						X								
24	Haiphong Power Plant	Haiphong	20 52-106 41	M	M						X								
25	Hongay Power Plant	Hongay	20 27-107 06	M	S						X								
26	Thuong Tin alcohol Industry	Thuong Tin	20 53-105 50	M	M			X											
27	Vinh Power Plant	Vinh	18 40-105 40	M	M						X								
28	Haiphong Docks	Haiphong	20 52-106 41	M	M							X							
29	Haiphong Coaling Station	Haiphong	20 52-106 41	M	M							X							
30	Port Redon	Port Redon	20 59-106 46	M	S							X							
31	Hongay Docks & Loading Facilities	Hongay	20 57-107 05	M	S							X							
32	Camrha Docks & Loading Facilities	Camrha	21 01-107 22	M	S							X							

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INDO-CHINA 85 NORTH 85.1

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Mns	Chemicals	Coke	Elec Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Key Trans	OTHER
35	Quang Yen Zinc Smelter	Quang Yen	20 56-106 48	M	S											X			
39	Standard Vacuum Oil Storage	Haiphong	20 52-106 39	M	M												X		
40	Texas Oil Storage	Haiphong	20 52-106 39	M	M												X		
41	North American Syndicate Oil Storage	Haiphong	20 52-106 39	M	M												X		
42	Shell Oil Storage	Haiphong	20 52-106 39	M	M												X		
43	Gialam Railroad Repair Shops	Hanoi	21 03-105 53	M	S													X	
44	Vinh Railroad Repair Shops	Vinh	18 40-105 41	M	P													X	
45	Tourane Railroad Yards	Tourane	16 04-108 12	M	S													X	
46	Hongay Railroad Yards & Workshops	Hongay	20 57-107 05	M	S													X	
49	Hanoi Railroad Station & Yards	Hanoi	21 01-105 50	M	S													X	
50	Col des Nuages Tunnels	Tourane	16 13-108 07	M	M													X	
52	Doumer Bridge	Hanoi	21 03-105 51	M	M													X	
53	Phuly Bridge	Phuly	20 32-105 55	M	M													X	
54	Haiphong Railroad Bridge	Haiphong	20 52-106 40	M	M													X	
55	Ham Rong Railroad & Highway Bridge	Thanh Hoa	19 51-105 47	M	M													X	
56	Quangtri Railroad & Highway Bridge	Quang Tri	16 46-107 10	M	M													X	
57	Hue Railroad Bridge	Hue	16 27-107 34	M	M													X	
58	Tourane Railroad & Highway Bridge	Tourane	16 07-108 08	M	M													X	
59	Quang Ngai Railroad	Quang Ngai	15 07-108 50	M	M													X	
62	Pont Tournant du Canal des Rapides	Hanoi	21 05-105 55	M	M													X	

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INDO-CHINA 85 SOUTH 85.2

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Nhs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
70	Mazet Alcohol Distillery	Saigon-Cholon	10 45-106 41	M	C			X											
71	Binthay Alcohol Distillery	Cholon	10 44-106 38	M	P			X											
72	Russey-Keo alcohol Distillery	Phnom Penh	11 37-104 55	M	S			X											
75	Hiep Hoa Sugar Refinery	Hoip Hoa	10 55-106 18	M	S			X											
79	Saigon-Cholon Power Plant	Saigon-Cholon	10 45-106 41	M	P						X								
82	Phnom Penh Power Plant	Phnom Penh	11 35-104 56	M	M						X								
85	Saigon Wharf Area	Saigon	10 46-106 42	S	P							X							
86	Andre Grillet Foundry	Saigon	10 46-106 41	M	C									X					
87	FACI Ship Repair & Barge Building Works	Saigon	10 46-106 42	M	S										X				
88	Saigon Navy Yard & Arsenal	Saigon	10 47-106 42	M	P										X				
89	Lavallois & Perret Machine Shops	Saigon-Cholon	10 45-106 41	M	S										X				
91	Cam Ranh Bay Naval Base	Cam Ranh Bay	11 53-109 09	M	S										X				
92	Phnom Penh Barge Building Works	Phnom- Penh	11 37-104 55	M	M										X				
93	Shell Oil Storage	Nha Be	10 42-106 45	M	P											X			
97	Bien Hoa RR & Highway Bridges	Bien Hoa	10 58-106 49	M	M													XX	
98	Binh Loi RR & Highway Bridge	Saigon	10 50-106 42	M	M													X	
100	Nha Trang RR Bridge	Nha Trang	12 16-109 10	M	M													X	
101	Tuy Hoa RR & Highway Bridge	Tuy Hoa	13 04-109 19	M	M													X	
102	Pursat RR Bridge	Pursat	12 33-103 50	M	S													X	
103	Mongkol Borey RR Bridge	Mongkol Borey	13 34-103 01	M	S													X	
104	Battambang RR Bridge	Battambang	13 05-103 12	M	S													X	
111	Mongkol Borey RR Yards & Shops	Mongkol Borey	13 34-103 01	M	S													X	

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INDO-CHINA 85 SOUTH 85.2

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N	CO-ORDS E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Shy Trans	OTHER
112	Phnom Penh RR Yards & Shops	Phnom Penh	11 35	104 55	M	P													X	
114	Dian RR Shops	Bien Hoa	10 54	106 45	M	P													X	
115	Saigon Newu RR Yards & Shops	Saigon	10 47	106 40	M	P													X	
116	Saigon RR Yards & Shops	Saigon	10 46	106 41	M	S													X	
119	Nha Trang RR Shops	Nha Trang	12 15	109 09	M	M													X	
121	S.V.O. Oil Storage	Nha Be	10 42	106 44	M	P												X		
122	Texas Oil Storage	Nha Be	10 41	106 45	M	P												X		

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JAPANESE PACIFIC ISLANDS

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JAPANESE PACIFIC ISLANDS KURILE ISLANDS 91.1

TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE: EMPIRE	IMPORTANCE: REGIONAL	CLASSIFICATION: Aircraft	Arms/Guns	Chemicals	Coke	Elec Eqp/Radar	Elec Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Ry Trans	OTHER
120	Kukumabetsu Harbor	Paramushiru	50 23-155 37									X			X				
121	Buroton Harbor	Shimushiru	47 09-152 13									X							
122	Hitokappu Harbor	Etorofu	44 59-147 43									X							
123	Matsugahama Harbor	Shikotan	43 44-146 42									X							
124	Seaplane Anchorage	Etorofu	45 02-147 43									X							
125	Shiramuka Anchorage	Kunashiri	44 21-146 27									X							
126	Chinomiji Hakuchi Anchorage	Kunashiri	44 15-146 10									X							
127	Tomari Anchorage	Kunashiri	43 43-145 31									X							
128	Inemoshiri anchorage	Shikotan	43 48-146 50									X							
129	Shakotan Anchorage	Shikotan	43 52-146 49									X							
130	Nemo Anchorage	Onekotan	49 36-154 48									X							
131	Kuroishi Anchorage	Onekotan	49 25-154 49									X							
132	Kashiwabara anchorage	Paramushiru	50 41-156 08									X							
133	Otamaye Anchorage	Paramushiru	50 11-155 39									X							
134	Musashi anchorage	Paramushiru	50 00-155 23									X							
135	Kukira Anchorage	Paramushiru	50 17-155 21									X							
136	Yetsuiwa Anchorage	Paramushiru	50 17-155 55									X							
137	Tokotan Anchorage	Uruppu	45 52-149 48									X							
138	Tsurigane Anchorage	Uruppu	46 -6-150 10									X							
139	Shimushiru Anchorage	Shimushiru	46 52-151 51									X							
140	Moyord Anchorage	Etorofu	45 26-148 51									X							
141	Tarremoye Anchorage	Etorofu	44 33-146 47									X							

ONLY - NON EVALUATED

THESE TARGETS ARE OF LIMITATIONAL IMPORTANCE

JAPANESE PACIFIC ISLANDS KURILE IS 91.1

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JAPANESE PACIFIC ISLANDS KURILE ISLANDS 91.1

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N	CO-ORDS E	IMPORTANCE: EMPIRE	IMPORTANCE: REGIONAL	CLASSIFICATION: Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Proy Trans	OTHER
142	Naibo Anchorage	Etorofu	44 44-	147 11									X							
143	Shimushu A/D	Shimushiru	50-45-	156 20																Advanced Base
144	Bettobu anchorage	Etorofu	45 17-	148 03									X							

DASH - NOT EVALUATED

BASE TARGETS ARE OF LOCAL/TACTICAL IMPORTANCE

KURILE 91.1

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FORMOSA INCLUDING PESCADORES ISLANDS 91.3 - 7

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	Elec Equ/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Ry Trans	OTHER
* 3	Nippon Aluminum Co	Takao	22 37-120 17	P	P											X			
4	Mitsubishi Oil Storage	Takao	22 37-120 17	M	S												X		
6	Industrial Alcohol Plant	Takao	22 37-120 17	M	M			X											
7	Kigo Naval Dockyard	Takao	22 37-120 16	M	S										X				
8A	Military Storehouses & Main Wharf	Takao	22 37-120 17	S	P							X							
8B	Takao River Wharves	Takao	22 37-120 19	M	S							X							
9	RR Yard & Repair Shops	Takao	22 38-120 16	M	S													X	
13	Asano Cement Plant	Takao	22 39-120 16	M	P														Cement
15A	NW Keelung Wharfes	Taihoku	25 09-121 44	S	P							X							
15B	Gyucho Ko Harbor & Dockyard	Taihoku	25 08-121 44	M	P										X				
15C	SW Keelung Wharves	Taihoku	25 08-121 44	M	S							X						X	
23	Sharyo Shipyard	Taihoku	25 10-121 45	S	P										X				
27	Hatto Bridges & Tunnels	Taihoku	25 07-121 44	M	S													X	
21	Taihoku RR Terminal	Taihoku	25 03-121 31	M	S													X	
32	Matsuyama RR Shops	Taihoku	25 03-121 35	M	P													X	
33	Kyushi Zan Oil Storage	Taihoku	25 09-121 44	M	S											X			
35	Hatto Shi Steam Power Plant	Taihoku	25 09-121 47	M	P					X									
36	Taihoku Transformer Station	Taihoku	25 01-121 32	M	S					X									
44	Kinkaseki Copper Works	Taihoku	25 07-121 51	S	S										X				
47	Jonai District	Taihoku	25 03-121 33	M	M														Admin.Dist.
52	Matsuyama Airport	Taihoku	25 04-121 33	M	P	X													
56	Toshien Dockyard	Takao	22 41-120 16	S	P									X					

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FORMOSA INCLUDING PESCADORES ISLANDS 91.3 - 7

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FORMOSA INCLUDING PESCADORES ISLANDS 91.3 - 7

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	Elec Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
57	Heito Airport	Takao	22 41-120 27	S	S	X													
61	Japan Aluminum Co	Taiwan E	24 00-121 27	S	S											X			
62	Nickel Smelter	Taiwan E	24 00-121 37	S	S											X			
64	Karenko Wharves	Taiwan E	24 00-121 38	M	S							X							
65	Suo Basin	Taiwan E	24 35-121 52	M	M							X					X		
66	Karenko RR Station & Yards	Taiwan E	23 59-121 36	M	S													X	
70	Maruyama Power Plant	Taiwan E	24 39-121 40	M	S						X								
82	Jitsugetsutan Power Plant No. 1	Taiwan W	23 51-120 52	S	P						X								
83	Jitsugetsutan Power Plant No. 2	Taiwan W	23 49-120 51	S	S						X								
85	Byoritsu Refinery	Taiwan W	24 34-120 49	M	M											X			
86	Kinsui Casing - Head Plant	Taiwan W	24 37-120 53	M	S											X			
87	Carbon Black Plant	Taiwan W	24 37-120 53	S	S			X											
89	Tainan Salt Works	Taiwan W	23 00-120 09	M	M			X											
90	Niisui Junction & Bridge	Taiwan W	23 47-120 38	M	S													X	
92	Shoka RR Terminal	Taiwan W	24 06 120 33	M	S													X	
95	Chikunan Terminal & Bridges	Taiwan W	24 41-120 48	M	S													X	
100	Coseci Harbor	Taiwan W	24 15-120 32	M	S							X							
103	Taichu Alcohol Plant	Taiwan W	24 08-120 42	M	M			X											
104	Kobi Sugar & Alcohol Plant	Taiwan W	23 42-120 46	M	M			X											
110	Tainan Magnesium Plant	Taiwan W	23 00-120 09	M	S										X				
119	Shukkoko Casing - Head Plant	Taiwan N	24 25-120 51	M	M												X		
145	Ansan Drydock	Pescadores	23 33-119 24	M	S									X					

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FORMOSA INCLUDING PESCADORES ISLANDS - 91.3 - 7

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	RWY Trans	OTHER
146	Ansan Wharves	Pescadores	23 33-119 34	M	S							X							
147	Bako Harbor	Pescadores	23 34-119 33	M	S							X							
150	Ansan Oil Stores	Pescadores	23 33-119 34	S	P												X		
151	Ansan Torpedo & Mine Stores	Pescadores	23 33-119 34	M	S		X												
152	Ansan Stores	Pescadores	23 33-119 34	M	S		X					X							
153	North Fort Magazine	Pescadores	23 34-119 35	M	M		X												
156	Bako Power Plant	Pescadores	23 34-119 34	M	P					X									
162	Toko Seaplane Base	Taiwan W	22 27-120 27	M	S	X													
164	Takao Substation	Takao	22 39-120 17	M	S					X									
165	Ansan Underground Oil Tanks	Pescadores	23 33-119 34	S	P												X		
166	Okayama Aircraft Plant	Taiwan W	22 48-120 16	S	P	X													
169	Kyoshito Sugar & Alcohol Plant	Taiwan W	22 46-120 17	M	M			X											
170	Shokai Shipyard	Taihoku	25 09-121 45	M	M										X				
171	Nansei Sugar & Alcohol Plant	Taiwan W	22 24-120 16	M	M			X											
172	Reigaryo Sugar/Alcohol Plant	Takao	22 34-120 19	M	M			X											
173	Western Wharf	Takao	22 37-120 16	M	P							X							
174	Takao RR Station	Takao	22 38-120 17	M	S												X		
175	Reigaryo Shipyard	Takao	22 37-120 18	M	S										X				
176	Reigaryo Military Stores	Takao	22 36-120 19	M	S		X					X							
177	North Takao Steam Power Plant	Takao	22 38-120 16	M	M					X									
178	Toshien Fuel & Munitions Depot	Takao	22 40-120 17	M	S		X										X		
179	Hozan Embarkation Camp	Takao	22 37-120 21	M	S							X							

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FORMOSA INCLUDING PESCADORES ISLANDS 91.3 - 7

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
180	Heito Sugar/Alcohol Plant	Takao	22 39-120 26	M	M			X											
181	Suisha Dam	Taiwan W	22 39-120 26	M	S						X								

FORMOSA INCLUDING PESCADORES ISLANDS 91.3 - 7

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THAILAND NORTH 98.1 BANGKOK 98.2 SOUTH 98.3

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Ammo	Chemicals	Coke	El Equ/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
1	RAF Workshops	Bangkok	13 48-100 32	M	M	X													
2	Royal Ordnance Factory	Bangkok	13 48-100 32	M	P		X												
3	Ban Khaen Army Chemical Works	Bangkok	13 51-100 36	M	M			X											
5	Thai Industries Ltd	Bangkok	13 41-100 30	M	M			X											
6	Don Muang A/D	Don Muang	13 55-100 37	M	P	X													
18	Naval Station & Ammunition Dump	Bangkok	13 40-100 35	M	M		X								X				
19	Fort Pisuasmut Naval Station	Bangkok	13 35-100 35	M	M										X				
26	Thai Electric Co Power Plant	Bangkok	13 44-100 30	M	S						X								
27	Samsen Steam Power Plant	Bangkok	13 47-100 31	M	S						X								
28	New Government Port area	Bangkok	13 42-100 35	M	P							X							
29	Bornea Co Wharves	Bangkok	13 43-100 31	M	M							X							
30	China Thai Wharf Co.	Bangkok	13 43-100 31	M	M							X							
31	Govt Oil Refinery & Tank Farm	Bangkok	13 42-100 33	M	P											X	X		
32	Asiatic Petroleum Storage	Bangkok	13 41-100 30	M	M											X			Tin
37	Makasan RR Workshop	Bangkok	13 45-100 33	M	P												X		
38	RR Workshops, Bangsue Station & Marshaling Yards	Bangkok	13 49-100 33	M	P												X		
39	Bangkok No 1 Station & Yards	Bangkok	13 46-100 29	M	S								X				X		
40	Hua Lampong Station & Yards (Union Station)	Bangkok	13 44-100 31	M	S												X		
41	Genkoi Switching Yards & Roundhouse	Genkoi	14 35-101 01	M	M												X		
42	Korat RR Yards, Station & Junction	Korat	14 58-102 05	M	M												X		
43	Tung Song Junction	Tung Song	08 09-99 40	M	M												X		
44	Haad Yai Junction	Haad Yai	07 01-100 28	M	M												X		

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THAILAND NORTH 98.1 BANGKOK 98.2 SOUTH 98.3

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Nbs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Ry Trans	OTHER
1	RAF Workshops	Bangkok	13 48-100 32	M	M	X													
2	Royal Ordnance Factory	Bangkok	13 48-100 32	M	P		X												
3	Ban Khaen Army Chemical Works	Bangkok	13 51-100 36	M	M			X											
5	Thai Industries Ltd	Bangkok	13 41-100 30	M	M			X											
6	Don Muang A/D	Don Muang	13 55-100 37	M	P	X													
18	Naval Station & Ammunition Dump	Bangkok	13 40-100 35	M	M		X								X				
19	Fort Pisuasmut Naval Station	Bangkok	13 35-100 35	M	M										X				
26	Thai Electric Co Power Plant	Bangkok	13 44-100 30	M	S						X								
27	Samsen Steam Power Plant	Bangkok	13 47-100 31	M	S						X								
28	New Government Port area	Bangkok	13 42-100 35	M	P							X							
29	Bornea Co Wharves	Bangkok	13 43-100 31	M	M							X							
30	China Thai Wharf Co.	Bangkok	13 43-100 31	M	M							X							
31	Govt Oil Refinery & Tank Farm	Bangkok	13 42-100 33	M	P											X	X		
32	Asiatic Petroleum Storage	Bangkok	13 41-100 30	M	M											X			Tin
37	Makasan RR Workshop	Bangkok	13 45-100 33	M	P													X	
38	RR Workshops, Bangsue Station & Marshaling Yards	Bangkok	13 49-100 33	M	P													X	
39	Bangkok No 1 Station & Yards	Bangkok	13 46-100 29	M	S							X						X	
40	Hua Lampong Station & Yards (Union Station)	Bangkok	13 44-100 31	M	S													X	
41	Genkoi Switching Yards & Roundhouse	Genkoi	14 35-101 01	M	M													X	
42	Korat RR Yards, Station & Junction	Korat	14 58-102 05	M	M													X	
43	Tung Song Junction	Tung Song	08 09-99 40	M	M													X	
44	Haad Yai Junction	Haad Yai	07 01-100 28	M	M													X	

NOTE: Bkk. BANGKOK 98.2, SOUTH 98.3

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THAILAND NORTH 98.1 BANKOK 98.2 SOUTH 98.3

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trns	OTHER
52	Ban Pachi RR Junction	Ban Pachi	14 27-100 44	M	M													X	
53	Bangkok Dock Co	Bangkok	13 43-100 31	M	M									X	X		X		
54	Ministry of Marine Compound	Bangkok	13 45-100 29	M	S							X		X	X				
55	Fort Chulachomklao	Bangkok	13 32-100 35	M	M										X				
56	Royal Irrigation Dept	Bangkok	13 47-100 31	M	M							X		X					
57	Satahib Naval Base	Satahib	12 40-100 53	M	P										X				
58	Ministry of Defense & AM Stores	Bangkok	13 45-100 30	M	M														Supplies
59	Thai Cement Co.	Bangkok	13 48-100 33	M	P														Cement
60	Government Distillery	Bangkok	13 46-100 30	M	S														Alcohol
63	Ban Mah Arsenal	Ayuthia	14 21-100 35	M	P	X													
64	Si Chang Island Oil Storage	Sichang	13 09-100 49	M	P												X		

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MALAY STATES NORTH 92.1

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Mnns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
24	Government Pier	Penang	05 22-100 19	M	M							X							
25	Shell Oil Pier	Penang	05 24-100 19	M	M							X					X		
26	Church Street & RR Wharves	Penang	05 25-100 21	M	M							X							
27	Swettenham & Victoria Piers	Penang	05 25-100 21	M	M							X							
28	Mitchell's Piers	Penang	05 24-100 22	M	M							X							
29	Lighter Pier	Penang	05 23-100 23	M	M							X						X	
30	Coal Wharf Area	Penang	05 23-100 23	M	M							X							
31	Penang Harbor Board Area	Penang	05 24-100 23	M	S										X				
32	Straits SS Co Dockyard	Penang	05 24-100 23	M	S										X				
33	Shell Oil Pier	Swettenham	03 00-100 23	M	M							X					X		
34	Northern Wharves Area	Swettenham	03 00-101 23	M	M							X							
35	Southern Wharves Area	Swettenham	03 00-101 23	M	M							X			X			X	
36	Standard Oil Co Pier	Swettenham	03 00-101 23	M	M							X					X		
37	Kuala Dungun Harbor	Kuala Dungun	04 47-103 26	M	M							X						X	
39	Tumpat Harbor	Tumpat	06 13-102 11	M	S							X						X	
40	Kota Bahru Harbor	Kota Bahru	06 09-102 14	M	S							X							
41	Endau Harbor	Endau	02 40-103 38	M	M							X							
42	Kemaman Harbor	Kemaman	04 15-103 26	M	M							X							
44	Bukit Besi Iron Mine	Bukit Batu Besi	04 45-103 10	M	M					X		X						X	
46	Temangan Iron Mine	Temangan	05 43-102 07	M	M					X		X						X	
47	Penang Tin Smelter	Georgetown	05 25-100 20	S	M										X				
49	Butterworth Tin Smelter	Butterworth	05 24-100 22	S	M										X				

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MALAY STATES NORTH 92.1

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
50	Malayan Collieries	Batu Arang	03 19-101 28	M	M						X								Coal
53	Machine Shop District	Ipoh	04 35-101 04	M	M								X	X					
54	Federated Engineering Co Ltd	Kaula Lumpur	03 08-101 42	M	M								X	X		X			
55	United Engineers Ltd	Georgetown	05 24-100 24	M	M							X	X	X					
56	Central RR Repair Shops	Sentul	03 11-101 41	M	P													X	
58	Guillemard RR Bridge	Tanah Merah	05 46-102 08	M	M													X	
59	Victoria RR Bridge	Enggor	04 50-100 58	M	M													X	
60	Kuala Lumpur RR Yards, North	Kuala Lumpur	03 09-101 42	M	S													X	
61	Kuala Lumpur RR Yards, South	Kuala Lumpur	03 08-101 41	M	P													X	
62	Gemas RR Junction	Gemas	02 35-102 37	M	S													X	
63	Prai RR Yards	Prai	05 23-100 23	M	M													X	
65	Perak Power Plant	Lake Chenderoh	04 57-100 58	M	S						X								
66	Penang Power Plant	Prai	05 23-100 23	M	S						X								
67	Bungsar Power Plant	Bungsar	03 07-101 40	M	S						X								
68	Malin Nawar Power Plant	Malin Nawar	04 21-101 07	M	S						X								
69	Batu Gajah Power Plant	Batu Gajah	04 28-101 03	M	S						X								
74	Butterworth Oil Storage	Butterworth	05 24-100 22	M	M												X		

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SINGAPORE 92.2

TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Mns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
10	Singapore Harbor Board Area	Singapore	01 16-103 49	S	P							X	X		X				
11	P & O & East Wharf Area	Singapore	01 16-103 50	S	P								X					X	
12	Empire Dock Area	Singapore	01 16-103 50	S	P								X					X	
13	Victoria & Albert Dry Dock Area	Singapore	01 16-103 51	S	P								X		X			X	
14	Telok Ayer Basin Area	Singapore	01 17-103 51	S	P								X					X	
15	Shell Oil Co Facilities	Singapore	01 27-103 46	S	P								X						
16	Ammunition Depot Jetty Area	Singapore	01 28-103 48	M	P		X						X						
17	Fourth Senoko Oil Depot	Singapore	01 27-103 48	S	P												X		
18	Naval Base Radio Station	Singapore	01 28-103 49	M	S														Communications
19	Sembawang River Area	Singapore	01 28-103 49	M	P								X					X	
20	Drydock & West Wall Area	Singapore	01 28-103 50	S	P										X				
21	Workshop Area	Singapore	01 28-103 50	M	P					X	X			X					
22	North Wharf Area	Singapore	01 28-103 50	M	P							X			X			X	
23	Naval Stores Basin Area	Singapore	01 28-103 50	S	P							X						X	
38	Batu Pahat Harbor	Batu Pahat	01 52-102 55	M	M							X							
43	Hume Pipe Co, Ltd	Singapore	01 20-103 48	M	S														Pipes
45	Sri Medan Iron Mine	Sri Medan	01 59-102 58	M	M						X		X					X	
48	Pulo Brani Tin Smelter	Brani Island	01 15-103 50	S	M											X			
51	Tandjong Rhu Shipyards	Singapore	01 18-103 52	M	M										X				
52	United Engineers, Ltd.	Singapore	01 18-103 51	S	P							X	X			X			
57	Singapore RR Yards	Singapore	01 16-103 50	M	S													X	
64	St James Power Plant	Singapore	01 16-103 50	M	S					X									

SING.PORE 92.2

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SINGAPORE 92.2

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
70	Alexandra Tank Farm	Singapore	01 17-103 48	P	P												X		
71	Kranji Tank Farm	Singapore	01 26-103 45	P	P												X		
72	Bukum Island Tank Farm	Bukum Island	01 14-103 46	P	P												X		
73	Shell Oil Storage	Singapore	01 16-103 50	S	P												X		

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NETHERLANDS EAST INDIES SUMATRA NORTH 94.1 SOUTH 94.2

TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Mnns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
13	Sabang Harbor	Sabang	05 53N-95 19E	M	S							X							
14	Belawan - Deli Harbor	Belawan	03 47N-98 41E	M	S							X							
15	Pangkalan Brandan Harbor	Pangkalan Brandan	04 02N-98 17E	M	M							X							
16	Pangkalan Soesoe Harbor	Pangkalan Soesoe	04 07N-98 12E	M	S							X							
23	Belawan Station & Yards	Belawan	03 47N-98 41E	M	M													X	
29	Sabang Electric Power Station	Sabang	05 54N-95 19E	M	M						X								
30	Bintan Island Bauxite Plant	Bintan Isl	00 50N-104 36E	S	S											X			
31	Belawan Oil Storage	Belawan	03 47N-98 40E	M	S												X		
33	Pangkalan Brandan Refinery	Pangkalan	04 02N-98 16E	P	P												X		
35	Poeloe Sambo Tank Farm	Samboe	01 09N-103 54E	S	P												X		
53	Palembang Harbor	Palembang	02 59S-104 47E	M	M							X							
53F	N.V.Industrieele Mij Palembang	Palembang	02 59S-104 45E	M	M									X					
54	Emma Haven	Padang	01 00S-100 22E	M	M							X							
☆ 61	Pladjoe Refinery	Palembang	03 00S-104 50E	P	P												X		
63	Kertapati RR Station & Yards	Palembang	03 01S-104 45E	M	M													X	
65	Parjang RR Station, Oosthaven	Oosthaven	05 28S-105 19E	M	M													X	
66	Padang RR Shops & Yards	Padang	00 57S-100 22E	M	M													X	
67	Idaroeng Cement Plant	Padang	00 57S-100 29E	S	P														Cement
231	Soengei Gerong Refinery	Palembang	02 59S-104 45E	S	P												X		
234	Medan RR Yards & Station	Medan	03 35N-98 42E	M	M													X	
235	Sigli Repair Shops & Sheds, Atjeh RR	Sigli	05 22N-98 59E	M	M													X	
237	Lahat RR Repair Shops	Lahat	03 48S-103 31E	M	S													X	

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TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Guns	Chemicals	Coke	El Equ/Radar	El Power	Harbor Fac/Wks	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rec Trans	OTHER
238	Bockit Asem Power Station	Tandjoeng Enim	03 46N-103 46E	M	M						X								
239	Oembilin Power Station	Sawahleonto	00 40S-100 45E	M	S						X								
269	Tandjoeng Oeban Oil Storage	Tandjoeng Oeban	01 04N-104 13E	S	P												X		
275	Deli RR Workshops	Medan	03 37S-98 41E	M	M													X	

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NETHERLANDS EAST INDIES JAVA 94.3

TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Engr/Radar	El Power	Harbor Fac/Wks	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
145A	Soerabaja Commercial Harbor	Soerabaja	07 12S-112 43E	M	S							X							
145B	Soerabaja Naval Harbor	Soerabaja	07 12S-112 44E	S	P										X				
146	Tandjoeng Prick Harbor	Batavia	06 06S-106 53E	M	S							X							
148	Semarang Harbor	Semarang	06 57S-110 25E	M	M							X			X				
149	Tjilatjap Harbor	Tjilatjap	07 44S-109 00E	M	M							X							
159	Bandoeng Quinine Factory	Bandoeng	06 54S-107 36E	M	S			X											
163	General Motors Assembly Plant	Batavia	06 06S-106 53E	M	S									X					
164	Goodyear Tire Factory	Buitenzorg	06 35S-106 47E	M	M														Rubber
171	Semarang RR Center	Semarang	06 58S-110 25E	M	M													X	
172	State RR Workshops, Manggarai	Manggarai	06 13S-106 51E	M	M													X	
173	Stata RR Workshops, Madioen	Madioen	07 40S-111 30E	M	M													X	
174	State RR Workshops, Goenbeng	Goenbeng	07 16S-112 45E	M	M													X	
175	RR Station and Repair Shops, Bandoeng	Bandoeng	06 55S-107 36E	M	M													X	
176	RR Station and Yards	Batavia	06 08S-106 59E	M	M													X	
177	Tandjoeng Prick RR Station	Tandjoeng Prick	06 07S-106 52E	M	M													X	
178	Soerabaja Town RR Station	Soerabaja	07 15S-112 45E	M	M													X	
179	Soerabaja RR Yards	Soerabaja	07 12S-112 44E	M	M													X	
181	Tjilatjap RR Station and Yards	Tjilatjap	07 44S-109 00E	M	M													X	
182	Lindetevos-Stokvis Co.	Semarang	06 58S-110 25E	M	M													X	
183	Braat Machine Shops	Soerabaja	07 17S-112 45E	M	M								X						
184	Ned. Indische Industrie	Soerabaja	07 14S-112 44E	M	M								X						
186	Oebroeg Power Station	Tjibadak	06 55S-106 46E	M	M					X			X						

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NETHERLANDS EAST INDIES JAVA 94.3

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Wks	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
187	Kratjak Power Station	Lewillang	06 37S-106 38E	M	M						X								
188	Batavia Power Station	Batavia	06 13S-106 51E	M	M						X								
189	Lamadian Power Station	Bandoeng	07 08S-107 33E	M	M						X								
190	Semanpir Power Station	Soerabaja	07 12S-112 44E	M	M						X								
195	Mendalen Power Station	Malang	07 50S-112 17E	M	M						X								
229	Tjepoe Refinery	Tjepoe	07 06S-111 35E	M	M						X								
230	Wonokromo Refinery	Soerabaja	07 18S-112 44E	M	M												X		
241	Pengkol Oxygen Factory (Nizaf)	Soerabaja	07 16S-112 14E	M	M			X									X		
242	Hoek's Oxygen Factory (Nizaf)	Bandjarin	07 05S-107 35E	M	M			X											
246	Nagel Rubber Co, Soerabaja	Soerabaja	07 17S-112 44E	M	M														Rubber
250	Semarang Shipbuilding and Repair Center	Semarang	06 57S-110 25E	M	S										X				
251	Soerabaja Drydock Co. Soerabaja	Soerabaja	07 12S-112 44E	M	S										X				
253	de Vulkaan Machine Shops, Soerabaja	Soerabaja	07 17S-112 44E	M	M									X					
254	Braat Machine Shop, Tegal	Tegal	06 51S-109 17E	M	S									X					
255	de Brome Machine Shop, Pascercean	Pascercean	07-38S-112 54E	M	M									X					
264	Bandoeng Arsenal, Bandoeng	Bandoeng	06 56S-107 40E	M	S		X												
266	Jogjakarta RR Yards & Workshops	Jogjakarta	07 48S-110 21E	M	M												X		
268	Tegal RR Station & Yards, Tegal	Tegal	05 52N-109 08E	M	M												X		
269	Tandjoeng Oeban Oil Storage	Tandjoeng	1 04N-104 13E	M	M														
271	East Java Literage Co.	Soerabaja	07 13S-112 45E	M	S										X				
272	BPM Black Oil Storage (Tandjong Prick)	Batavia	06 06S-106 53E	M	S												X		
273	Se Oil Storage (Tandjong Prick)	Batavia	06 06S-106 53E	M	S												X		

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NETHERLANDS EAST INDIES JAVA 94.3

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Ammo	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Shs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
274	Standard Blaak Oil Installations (Tandjong Prick)	Batavia	06 06S-106 53E	M	S												X		
276	General Motors Assembly Plant	Tjonosari	07 37S-110 44E	M	S		X												
277	Standard Oil Installations (Tandjong Perak)	Soerabaja	07 12S-112 43E	M	S												X		
278	BPM Bandarin Oil Installations (Soerabaja)	Soerabaja	07 13S-112 43E	M	S												X		
279	BPM Pasar Toeal Oil Installations	Soerabaja	07 15S-112 44E	M	S												X		
289	Semapir & KeDondong Oil Storage	Soerabja	07 13S-112 45E	M	S												X		

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NETHERLANDS EAST INDIES BORNEO NORTH 81.1 SOUTH 94.4

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Wks	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
8	Lutong Refinery (Borneo North)	Miri	04 28N-114 00E	S	P												X		
224	Tarakan Storage Tanks	Tarakan	03 17N-117 36E	P	P												X		
225	Balikpapan Refinery	Balikpapan	01 16S-116 49E	P	P												X		

NETHERLANDS EAST INDIES 81.1 BORNEO NORTH 94.4 SOUTH

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NETHERLANDS EAST INDIES CELEBES 94.5

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS	IMPORTANCE: EMPIRE	IMPORTANCE: REGIONAL	CLASSIFICATION: Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
215	Makassar Harbor	Makassar	05 08S-119 24E	M	S							X							
227	Pomelaa Mine and Plant	Pomelaa	04 11S-121 37E	S	S											X			
232	Boela Oil Installations	Boela	03 06S-130 30E	M	S												X		

NETHERLANDS EAST INDIES CELEBES 94.5

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PHILIPPINES 96 NORTH 96.1 SOUTH 96.2

TARGET NO.	TARGET NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION: Aircraft	Arms/Muns	Chemicals	Coke	Elec Eqp/Radar	El Power	Harbor Fac/Wks	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
2	Calambayanga Island Pier	Calambayanga Is.	14 19-122 39	M	S							X							
3	Agusan Mine, Malaguit Bay Port	Paracale	14 15-122 48	M	S							X							
5	Masinloc Port	Masinloc	15 33-119 57	M	S							X							
7	Balurate Port	Balurate	15 45-119 53	M	M							X							
8	Lepanto Concentrating Mill & Smelter	Mankayan	16 50-120 46	P	P											X			
9	San Fernando la Union	Poro Point	16 37-120 18	S	S							X							
11	Old Manila Piers & Port District	Manila	14 35-120 58	S	S							X							
15	Caloocan RR Shops & Yards	Caloocan	14 39-120 59	M	P													X	
16	Clark Field	Ft. Stotsenburg	15 10-120 33	M	P	X													
17	Nichols Field	Manila	14 31-121 00	M	P														Air Base
19	Cavite Naval Base	Manila	14 29-120 55	S	S										X				
20	Atlantic, Gulf & Pacific Co. Manila Plant	Manila	14 35-120 59	M	S										X				
22	Philippine Refining Co	Manila	14 35-121 01	M	S														Coco Oil
23	Spencer Kellogg & Sons	Manila	14 35-121 00	M	S														Coco Oil
30	Tondo Station & RR Yards	Manila	14 37-120 58	M	P													X	
31	Philippine Mfg Co.	Manila	14 37-120 58	M	S														Coco Oil
32	Elizalde Rope Factory	Manila	14 36-120 58	M	M														Rope
33	Philippine Slipways	Manila	14 35-120 59	M	M										X				
34	Varadero Slipways	Manila	14 35-120 59	M	M										X				
35	Manila Electric Co Steam Plant	Manila	14 35-120 59	M	P					X									
36	Johnson Pickett Rope Co	Manila	14 35-120 59	M	M														Rope
37	Manila Cordage Co.	Manila	14 35-121 00	M	M														Rope

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TARGET NO.	NAME	GENERAL LOCATION	CO-ORDS N E	IMPORTANCE EMPIRE	IMPORTANCE REGIONAL	CLASSIFICATION Aircraft	Arms/Muns	Chemicals	Coke	El Eqp/Radar	El Power	Harbor Fac/Whs	Iron/Steel	Mch/Mch Tls	Nav B/Ship Yds	Non F Metals	Petroleum	Rwy Trans	OTHER
38	Manila Gas Plant	Manila	14-35-121 00	M	S														Gas
39	Insular Refining Co.	Manila	14 36-121 00	M	M														Coco Oil
40	Pandacan Oil Storage	Manila	14 36-121 00	M	S												X		
41	Santa Mesa RR Bridge	Manila	14 36-121 01	M	M													X	
42	Atlantic Gulf & Pacific Co Rizal Plant	Manila	14 35-121 00	M	S										X				Machine Shop
47	Manila Electric Co. Hydro Plant	Botocan Falls	14 09-121 31	M	P						X								
48	Philippine Government Hydro Plant	Lumban	14 18-121 28	M	P						X								
49	Rizal Cement Co.	Binangona	14 28-121 12	M	M														Cement
51	Pambujan Sur	Samar Isle	11 15-125 32	M	S							X							
56	RR Yards & Asiatic Petroleum Co. Storage	Iloilo	10 42-122 35	M	S												X		
57	Texas Co Oil Storage	Iliolo	10 42-122 34	M	S												X		
58	Standard Oil Storage	Iliolo	10 42-122 34	M	S												X		
60	Cebu Cement Plant	Naga	10 12-123 45	M	S														Cement
61	Cebu Port & Docks	Cebu	10 18-123 54	M	S							X							
66	Santa Ana Port	Davao	7 04-125 36	S	P							X							
67	Legaspi Port Area	Legaspi	13 09-123 45	M	M							X							
70	Manila North Dock Area	Manila	14 36-120 58	M	M							X							

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297	142.621-4	Oct/43	1		Japan Incending Attack Data.	U	
510	↓	Oct/43	2		Japan Incending Attack Data.	U	
558	142.621-4	Oct/43	2&3		Japan Concentrated Target Areas.	U	
731	142.621-5	1940-1945			Targets-Japan.	U	
740	142.621-6	Jul/44			Targets-Japan.	U	
749	142.621-7	Nov/44			Radar Operations Target Folders.	U	
784	142.621-8	Apr/44			Gas Attacks on Japan.	U	
904	142.621-9	Dec/44			Gas Attachs on Formosa.	U	
1028	142.621-10	Sep/43			Industrial Installation Asiatic Axis.	U	
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